FORESTRY ABSTRACTS

VOLUME 17 1956 NUMBER 4

TIMBER DECAY—A SURVEY OF RECENT WORK*

8. DECAY OF WOOD IN STORAGE AND TRANSPORT

(A) LOGS

Pulpwood mills have to hold large stocks of wood in the round and serious losses may occur if the storage period is prolonged. Extensive studies in Scandinavia have been made by Björkman (1946*a*) who found that the loss in yield of pulp, brought about mainly by *Stereum sanguinolentum*, was 1–3% after one year's storage and about 10% after two years. A study of humidities existing within piles of pulpwood showed that storage decay fungi developed most actively at moisture contents between 35 and 85%. Fruit bodies, which appear under slightly drier conditions, are always a sign of advanced decay. Björkman (1946*b*) studied storage decay in Pine sawlogs and finding that appreciably more decay developed in wholly barked logs, recommended that logs possessing sufficient buoyancy should be floated unbarked.

Lindgren (1953) studied the deterioration of Southern Pine pulpwood during storage and found that losses in specific gravity of 3–5% can be expected within about two months in summer and five to six months of autumn and winter storage, unbarked bolts showing less deterioration during this period than barked ones. Measures to increase the rate of drying reduced losses in barked, but not in unbarked logs. He also found *Peniophora gigantea* to be the main cause of decay in the earlier stages, *Lenzites sepiaria* becoming important after six months. Lindgren and Harvey (1952) suggested spraying piles of logs with solutions of fluorides which, while inhibiting the growth of wood-rotting fungi, favour the development of green moulds such as *Trichoderma*. This mould seems to contribute to the control of the decay fungi and at the same time greatly increases the permeability of the wood to fluids. The deterioration of Poplar logs (for pulpwood) stored for periods of up to 3 years, was studied by Fritz (1954) who found that with the exception of *Poria cocos*, which spread vigorously from log to log, the heart-rot fungi present in the logs when they were felled did not spread in the piles; the storage rot-fungi were all white-rot species. Many studies that cannot be noticed here individually have been made of the effect of decay on the quality and quantity of pulp manufactured from logs showing decay in varying degrees. A review of the literature on the microbiology of pulpwood has been published by TAPPI (1955).

Undoubtedly the most satisfactory method of storing logs of perishable species is to submerge them under water in a log storage pond, but storage under a continuous spray has been shown to give almost as good results. Thus Hansbrough (1953) reported that Birch logs stored for 6 months under a continuous spray yielded as much high-quality veneer, free from fungal staining and decay, as freshly cut logs. In order effectively to protect Beech logs stored from March to October, Fronius (1953) considered it necessary to spray them continuously from sunrise to sunset, so creating a continual flow of water through them and keeping those at the bottom thoroughly wet. Scheffer and Jones (1953) found that storage of logs of perishable hardwoods under wet hay afforded moderate protection, and that logs of Birch and Maple could be protected for 2–3 months by spraying with a fungicide. For longer protection the logs required end coating in addition, to prevent seasoning checks. Nylinder and Rennerfelt (1954), who studied the deterioration of Spruce logs floating in round booms and in bundles, found that decay occurred at the water line. Logs cut in September showed more decay than logs felled in the winter.

The general fungal flora of wood in various stages of decomposition has been studied by Mangenot (1952), who followed its changes in composition by means of isolations from logs of Ash, Alder, Birch, Willow and Beech, and from Beech sawdust.

The application of fungicides to newly felled logs gives a certain measure of protection, but if the species of wood is also susceptible to ambrosia-beetle attack, it may be necessary to incorporate a contact insecticide in the spray. The fungicides used for control of sapstain have been found effective for protecting logs when used at three to five times the concentration normally used for sawn timber, while γBHC has proved outstandingly effective against the insect pests of logs. In addition to treatment with a fungicide, it is usually necessary to apply a moisture-retardant coating to prevent end-splitting of logs of species such as Beech. Beech logs sprayed with 5% Na pentachlorophenate and given a bituminous end-coating have been found to be in much better condition than untreated logs after twelve months' exposure on the ground (*Rep. For Prod. Res. Bd., Lond. 1954*).

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* For corrigenda to the first part of this article see p. 486.

(B) SAWN TIMBER

Dipping sawn lumber in sapstain-control chemicals gives a fair degree of protection against decay even if the timber is bulk piled immediately after sawing. Wright and Hartley (1945) reported practically no decay in 4 × 4-in. pieces of Western Hemlock, Sitka Spruce and Douglas Fir, that had been dipped in chlorophenates or Lignosan and then bulk piled for 12 months. When timber of any of the less durable species has to be shipped before it is dry, it is most desirable that it should be protected against sapstain and decay by fungicidal treatment. Many vexatious claims for deterioration of cargoes of timber could be avoided were such treatment more generally applied.

9. DECAY OF WOOD IN USE

(A) DRY ROT IN BUILDINGS

During the last war and the years immediately following it, dry rot became a serious problem in buildings that had suffered war damage or neglect, leading to the entry of damp. A general survey of the problem was given by Findlay (1951*a*), who recalled the early attempts of the Royal Society of Arts to find a solution. A fifth, revised edition of the Bulletin on dry rot by Cartwright and Findlay was published in 1952. Most of the damage to timber in buildings in Northern Europe can be attributed to two species of fungi—*Merulius lacrymans*, which causes the really extensive outbreaks of true 'dry rot', and *Coniophora cerebella*, which is extremely common wherever damp penetration has occurred. Bavendamm (1951–53) published useful illustrated summaries of all the available information about the more important fungi causing decay in buildings in Europe, and Lohwag (1952*b*) issued a list of all species that had been reported in buildings anywhere in the world.

Heim (1942) described and figured the principal fungi that attack buildings in France. Findlay (1951*b*) noted the occurrence of other fungi of less common occurrence in British houses. Theden (1953), analysing the species she had found in Berlin buildings, found *M. lacrymans* to be responsible for over half the cases investigated. Lohwag (1955) described in a well illustrated booklet the principal fungi responsible for the decay of timber in buildings in Austria. Bagchee (1954) reported the discovery of *M. lacrymans* on felled Spruce logs in open forests in the temperate regions of the inner Himalayas at altitudes of 8,000–10,000 ft. It was also observed in buildings in the higher hill stations of North India.

Dry rot caused by *M. lacrymans* is of minor importance in America, where its place is largely taken by *Poria incrassata*, and the problem of preventing decay in house timbers differs in many respects from that in Europe. Davidson and Lombard (1953) described the appearance in culture of the large-brown-spored house-rot fungi of the U.S.A. and showed how they could be distinguished on the basis of their temperature relations. Silverborg (1953), who listed the fungi associated with decay of wooden buildings in New York State, found *Odontia spathulata* and *Lenzites sepiaria* to be the most frequent species in that area. Condensation of moisture rising from uncovered soil below the building appears to be a frequent cause of dampness and rot in floors; Diller (1946) and Moses (1954) were able to show that covering the earth in the 'crawl space' with asphaltic roofing felt greatly reduces humidity below the floor. Verrall (1953), studying the factors leading to decay of siding in wooden buildings, emphasized the importance of a good roof overhang and the value of dipping the siding in toxic water-repellent preservative. Eradication of *M. lacrymans* from infected walls, which often presents a difficult problem, has been facilitated by the development of new fungicides. A solution of pentachlorophenate has been found to be more effective than the fluoride solutions previously used. Theden, Starfinger and Becker (1953) described a laboratory method for testing the effectiveness of fungicides on mortar. The use of a fungicidal rendering consisting of a special zinc-oxychloride cement for the treatment of walls infected with dry rot has been suggested by Mack and Savory (1952). Good practical advice for preventing dampness reaching timber in buildings, and on preservation and the treatment of dry rot, is contained in a German book by Wünsche (1952).

(B) DECAY OF WOOD IN BOATS

A large number of wooden craft were constructed for military purposes during the war, and many of these have since been adapted for other uses. Serious decay has developed in a number of such craft, many of which were kept idle in storage or reserve for a number of years. Decay of woodwork is also not uncommon in pleasure craft that are laid up for many months in the year.

Experience has shown that a boat is much more liable to fungal deterioration when laid up than when in constant use. Savory (1954*c*), in a survey of the causes of decay in wooden boats, pointed out that leakage of fresh water through the decks is a frequent cause of trouble, and that hull and deck linings often prevent the discovery of leakage and decay until they become extensive. Premature decay of African Mahogany planking is not uncommon in craft used in tropical waters, and the use of naturally durable timbers or of wood treated with preservatives of the solvent type has been recommended. Failure of plywood, even when bonded with synthetic-resin glue, has resulted from use of veneers of non-durable species untreated with any preservative. Softening round the metal fastenings in boats working in sea water is often the result of electrochemical action on the metals, liberating acid or alkali that causes chemical breakdown of the wood.

Prevention of decay in boats has received considerable attention in the U.S.A. A report from the Division of Forest Pathology, U.S.D.A. (1953) summarizes the information available at that time. It is concluded that the heaviest decay losses have been due to lack of protection against rain in boats stored on land. The absence of ventilation in forepeak and stern compartments is cited as another common source of trouble. A survey of the causal fungi was made by Davidson, Lombard and Hirt (1947), who found species of *Poria*, especially *Poria monticola* (= *P. microspora*), to be the most frequent causes of rot. In England *Coniophora cerebella* is probably the commonest cause, though its fructifications are not very often observed.

Tippo *et al.* (1947) studied the effectiveness of various preservatives in preventing the spread of decay from a piece of already infected wood. They recommended that the paint should be removed from the sound wood round the decayed area, and the wood thus exposed thoroughly dressed with a pentachlorophenol solution. Scheffer (1953) suggested that the addition of a fungicide to the bilge water may give worthwhile protection to the timbers and planking in the bilge area, especially in ships operating in fresh or brackish water, and recommended orthophenyl phenol and pentachlorophenol for the purpose.

10. LABORATORY TESTING OF WOOD PRESERVATIVES

While the practical aspects of wood preservation lie outside the scope of this review, it would be incomplete without some mention of laboratory work on the toxicity of wood preservatives.

Estimations of toxicity by determining the toxic limits inhibiting growth of test fungi on nutritive agar media containing various concentrations of the fungicide, have now been largely abandoned in favour of methods involving the exposure of small pieces of wood impregnated with the preservative and exposed to fungal attack under controlled conditions. Schulze *et al.* (1950) have tabulated the collated results of a large number of tests made by this method. In Europe the test fungi are ordinarily cultivated on malt agar in flat Kollé flasks, and most tests in Great Britain, Germany and Sweden have followed the general lines suggested in the British and German standard methods published by the Standard Institutions of those countries ('standard block test'). In France, however, Alliot (1945) developed a method similar in general principles but employing a very much smaller block, measuring 3 × 1 × 0·5 cm., which could fit conveniently into ordinary test tubes. He also described the use of reflux condensers for continuous leaching of treated samples.

In order to shorten the time required to complete a standard wood-block test, Trendelenburg (1940) suggested that the amount of fungal attack might be estimated by the loss in impact bending strength, which becomes measurable very much more rapidly than loss in weight; for instance, test pieces that had lost by *Coniophora* attack only 6·8% of their weight after 130 days' exposure, had meanwhile suffered 83·9% loss in impact bending strength. Although results are quicker by this method, it has not been generally adopted, probably because it involves selecting perfectly straight-grained wood of uniform structure for the test pieces; and also because many laboratories carrying out toxicity tests are not equipped for mechanical testing of wood.

Mateus (1954) described a method for following the progressive loss in bending strength of test pieces undergoing decay, by measuring the deflection of the test piece while still in the culture vessel. While this method might prove very useful in fundamental studies of the progress of fungal decay under various controlled conditions, it would seem rather too elaborate for routine toxicity tests. Theden and Starfinger (1952) described an accelerated test in which the samples were reduced to 5 × 0·7 × 0·4 cm. and exposed to cultures in test tubes as in Alliot's test. They found that the toxic limits so determined were not always the same as those determined by the standard method and that with these 'small bars' (test pieces) there was greater variation in amount of decay round the threshold values.

In the U.S.A., workers have experienced some difficulty in maintaining optimum humidity conditions in the test pieces in the standard block test when the fungus is grown on agar, and the use of soil for stabilizing the moisture content of the test pieces has been proposed. At first the test fungi were cultured directly on soil, but since this is such a variable substance and is not suitable for the growth of all the usual test fungi, the workers using this 'soil-block' method (first described by Leutritz (1946) and studied by Sedziak (1952)) now recommend that the test fungi should be cultivated on 'feeder' strips of untreated wood, which are laid on the surface of the moist sterilized soil. If the soil has been moistened to a suitable degree (which depends on its humus content) it will maintain a suitably high and uniform atmospheric humidity within the culture vessels during the period of the test. There is some evidence to show that the presence of the soil appreciably stimulates the growth of some but not all of the test fungi used. Richards and Addoms (1947), who carried out some comparative tests using the agar and soil culture techniques, concluded that reliable results could be obtained by either method except with a hygroscopic preservative, when soil is preferable because the treated blocks absorb too much water when exposed over agar cultures.

Colley (1953) made a comprehensive survey of methods for the evaluation of wood preservatives and concluded that a soil-block technique incorporating a weathering procedure is a practical and rapid method of bio-assay and that the results obtained are in general agreement with those of graveyard tests. The results obtained with agar and soil media have been compared by Varner and Krause (1951) who found similar relative toxicity ratings for phenyl mercury oleate and pentachlorophenol by the two methods; these authors suggested that ease of operation should therefore determine the choice of method. They pointed out that an agar-block test with six replications could be made with considerably less time and effort than a soil-block test with only four replications. Duncan (1953), on the other hand, considered the use of soil to have certain advantages over malt agar in that: (1) Soil maintains a more even moisture content. (2) Soil absorbs volatile toxic constituents of preservatives which are thereby kept from exerting a greater influence than they would in practice. (3) The feeder strips provide a natural source of food for the fungi. (4) The threshold values (toxic limits) more closely approach those found in the field. (5) Soil culture 'responds to a wider range of solution strengths'. Like Colley, she emphasized the importance of first exposing treated blocks to weathering tests involving factors of evaporation, leaching and heat.

Rennerfelt (1954) compared the toxic limits obtained for creosote and two mixtures of salts by the standard block test and by the Leutritz soil-block method. He found that results for the water-borne salts were practically identical for both methods but that distinctly higher values were obtained for creosote by the latter. In the reviewer's opinion the smaller size of the cubical block used in the Leutritz method may have permitted more of the volatile constituents to escape during the drying period than occurs with the standard oblong test piece.

Zubieta *et al.* (1953) described refinements in the soil-block method and recommended the preparation of a carefully prepared soil mixture containing sand, clayey soil and humus, which is moistened with a nutrient solution containing K phosphate, NH_4NO_3 and $MgSO_4$ plus a solution of $Al_2(SO_4)_3$ to adjust the soil to a definite pH. They did not consider aeration of the flasks during the period of the test to be necessary, but they insisted on the need for including tests for resistance to leaching and evaporation, and suggested one involving 10 cycles each consisting of 2 hours' washing in running water, then 18 hours in the air of the laboratory, followed by 6 hours in an oven at 50° C.

When carrying out toxicity tests on wood preservatives it has been customary in Europe to include a duplicate set of samples that have been exposed to a leaching procedure in order to determine the residual toxicity of the preservative in the wood. The degree to which water-borne preservatives become insoluble or 'fixed' in wood has an important influence on their permanence in exposed conditions. Certain fractions of tar-oil preservatives may evaporate from the treated wood and their persistence may depend more on their rate of evaporation than on their solubility in water. Laboratory tests have been designed to accelerate the rate of loss of preservatives by leaching and evaporation, but there is as yet no general agreement as to the precise form which tests should take or how far their results can be used to predict the practical performance of preservatives. Most workers, however, agree that laboratory tests of persistence are useful at least for eliminating those preservatives that will not last under outdoor conditions, and Colley (1953) goes so far as to assert that the use of controlled weathering procedure will provide a means of determining truly effective threshold retentions for oil-type and salt-type preservatives for comparable service requirements.

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CORRIGENDA

For. Abstr. 17 (3): p. 318, Sect. 2, line 1, *for* Findlay (1950) *read* Findlay (1950*a*)
p. 322, Subsect. (G), lines 3 and 8, *for* Findlay (1950) *read* Findlay (1950*b*)
—, Subsect. (H), line 5, *for* Lohwag (1952) *read* Lohwag (1952*a*)
p. 324, Subsect. (A), line 3, *for* Buro (1954) *read* Buro (1954*a*)
p. 325, para. 3, line 1, *for* Wood (1954) *read* Wood (1955)
—, Subsect. (B), line 11, *for* Schaile (1951) *read* Schaile (1950)
p. 327, line 5 from bottom, *for* Buro (1954*c*) *read* Buro (1954*b*).

(*The previous part of the above article appeared in* For. Abstr. 17 (3). *Reprints of the whole article are available from* Central Sales Branch, Commonwealth Agricultural Bureaux, Farnham Royal, Bucks., England, *at* 4*s.* 0*d. each post free.*)

ABSTRACT SECTION

0. FORESTS, FORESTRY, AND THE UTILIZATION OF FOREST PRODUCTS: GENERAL

For general *regional* accounts see section 90

Translations

See Nos. 4022, 4123, 4431, 4487, 4493, 4500, 4522, 4535–7, 4621.

0 (02). Handbooks. Manuals. Textbooks

3553. Misson, A., and Schmitz, A. Manuel d'instruction à l'usage de gardes forestiers indigènes (Première partie). **[Instruction manual for African forest guards (Part I).]** *Publ. Com. spéc. Katanga* No. 13*B* [1956?]. pp. 19 + 49 photos + 1 dgm. [Swahili, F.]

This first part carries outline instructions, in French and Swahili, on herbarium-specimen and seed collection, soil sampling, use of the compass, and the measurement of distance, height and diameter of trees and the volume of stacks.

0 (047). Reports

3554. ***Bolu Orman Araştırma İstasyonu yıllık bülteni.*** Bolu Orman Araştırma İstasyonu, Ankara, Turkey.

The annual report of the Bolu Forest Research Station. No. 1 carries 7 articles explaining the programmes of the respective research sections and also a short account of the silvicultural work done in the Bürjükdüz Experimental Forest. Citation in *For. Abstr.*: *Bolu Orm. Araşt. İstasyonu Yıl. Bült.*

0 (048.1). Bibliographical Lists

See also Nos. 3639, 3795, 4001, 4052, 4508.

3555. Flick, F. J. **Economics of forestry: a bibliography for the United States and Canada, 1948–1952.** *Library List, U.S. Department of Agriculture, Washington* No. 52 (Suppl. No. 1), 1955. pp. 136.

Arrangement is similar to that in the list for the period 1940–7 [see *For. Abstr.* 13 (No. 3553)]. There are 3466 entries.

0 (05). Periodicals. Yearbooks. Directories. Almanacs, Calendars, Diaries

3556. ***Sborník Československé Akademie Zemědělských Věd (Řada Lesnictví).*** Československa Akademie Zemědělských Věd, Praha. 2-monthly. Subscription *Kčs.*120 p.a. Ca. 1000 pp. per year.

From 1955, *Sborník Československé Akademie Zemědělské* is split into 5 sections. The forestry section (*Řada Lesnictví*) begins at Vol. 28 in continuation of the original volume numbers. It is to represent Czechoslovak forestry in the international field, as *Lesn. Práce* is now a popular periodical. It contains articles in Czech with Russian summaries, and sometimes with titles and summaries in German or another European language. Citation in *For. Abstr.*: *Sborn. čsl. Akad. zeměd.* (*Lesn.*).

3557. ***Sylwan.*** Panstwowe Wydawnictwo Rolnicze i Leśne, Warszawa.

From Vol. 100, 1956, *Sylwan* becomes a monthly and will be divided into series A (scientific papers and reports) published in odd months, and series B (silvicultural problems) published in even months. Subscription *Zł.* 84 per year.

3558. ***Bolu Orman Araştırma Istasyonu Dergisi.*** Bolu Orman Araştırma Istasyonu, Ankara.

No. 1, 1954 (32 pp.) carries 4 articles, all in Turkish. Citation in *For. Abstr.*: *Bolu Orm. Araşt. Istasyonu Derg.*

3559. ***Bulletin of the Research Council of Israel. Section D. Botany.*** The Weizmann Science Press of Israel, Jerusalem.

From Volume 5, the *Bulletin of the Research Council of Israel* is divided into 4 sections, each appearing under a separate cover. These are: A. Mathematics, Physics and Chemistry. B. Biology and Geology. C. Technology. D. Botany. Section D continues the activities of the *Palestine Journal of Botany*, both the Jerusalem and the Rehovot series. Citation in *For. Abstr.*: *Bull. Res. Coun. Israel.*

0 (084.3/.4). Maps. Atlases

See also Nos. 4637–8.

3560. Weltforstatlas. **[World forestry atlas [part].]** Fritz Haller Verlag, Berlin. 1954–1955.

[Cf. *For. Abstr.* 16 (No. 3717).] Four further map sheets, as follows:—Germany (percentages of forest area, coniferous and broadleaved forest, high forest and coppice; distribution of *Pinus*, *Picea*, *Abies*, *Fagus*, *Quercus* and *Betula*); Czechoslovakia (percentages of forest area, coniferous and broadleaved forest, high forest and coppice; annual increment per ha.; distribution of *Pinus*, *Picea*, *Abies*, *Fagus*, *Quercus* and *Larix*); Soviet Russia (percentage of coniferous and broadleaved forest; wood supply zone; exploitable growing stock per ha.; forest regression since 1870; transport of wood and position of sawmills); Turkey (distribution of the most important species; distribution of productive forest, degraded forest, coppice and *Quercus aegilops*, and size of sawmills).

0 - - 011. Terminology. Nomenclature

See Nos. 3660–2, 3781.

0 - - 014. Classification

3561. FLICK, F. **Applying the Oxford system [of decimal classification for forestry] in America.** *J. For.* 54 (5), 1956 (325–8). 5 refs.

The kinds of collection to which the system is suited are listed, and some suggestions are made for its adaptation to specialized forestry collections.

0 - - 019. Miscellaneous Research Methods (including Photography)

3562. BROWN, G. S. **Forest photography.** *Malay. Forester* 19 (2), 1956 (59–69 + 11 photos).

Discusses choice of camera, film etc. and the peculiar problems of light, focus etc. presented by conditions inside a forest.

1. FACTORS OF THE ENVIRONMENT. BIOLOGY

11. Site Factors: Climate, Situation, Soil, Hydrology (Water Conservation, Soil Conservation and Erosion)

111. The Atmosphere. Meteorology. Climate and Microclimate

111.5. Wind

See Nos. 3914, 3961 *et seq.*

111.7. Humidity, Evaporation. Clouds etc. Precipitation

3563. MÄRK, J. Die Lawinenkatastrophe in Vorarlberg. **[The avalanche disaster in the Vorarlberg.]** *Allg. Forstztg.* 65 (5/6), 1954 (59–60). [G.]

Discusses the disasters of 1953, and seeks to prove that forest destruction and overcutting have not been contributory causes, the forest having, in fact, extended its area in the stricken parts of the country during the last 100 years. In many cases forests remained undamaged but lower-lying houses were destroyed.

111.8. Climatology. Climate and Microclimate

See also Nos. 3755, 3908, 3961 *et seq.*

3564. WOLFE, J. N., and GILBERT, G. E. **A bioclimatic laboratory in Southern Ohio.** *Ohio J. Sci.* 56 (2), 1956 (107–20). 5 refs. C.G.B.

Describes, with some preliminary data, the objects of a long-term study in ecology, phenology, microclimate and hydrology.

3565. DAUBENMIRE, R. **Climate as a determinant of vegetation distribution in Eastern Washington and Northern Idaho.** *Ecol. Monogr.* 26 (2), 1956 (131–54). 106 refs.

The natural vegetation of eastern Washington and northern Idaho ranges from hot semi-desert with < 16 cm. of precipitation to cold mesophytic forest with > 110 cm. After an intensive study of vegetation mosaics in this region, established weather stations were selected to represent each of the major types of vegetation that were judged to reflect climatic influence most directly. Climatic data accumulated at these stations were used to determine if certain schemes for the quantitative classification of climate can be used to distinguish areas having approximately equal potentialities for vegetational development. The climatic classifications of Köppen, Thornthwaite and Swain proved to have no value in this connexion; the same climatic symbol is usually encountered in several different vegetation belts, and there is no significant tendency for the stations in one belt to be represented by the same symbol. Even the distinction between grassland and forest climates cannot be defined consistently by these techniques. Attention was next directed to the possibility of discovering if other criteria exist which demonstrate the climatic distinctiveness of these phytogeographic units. A rather high degree of success was achieved largely through plotting mean monthly temperatures against median monthly precipitation. In the main, each vegetation type differs from its neighbours in the degree of summer drought, except at the wet end of the climatic gradient, where heat deficiency in summer becomes decisive.

The inherent weaknesses of universal climatic classifications so far as phytogeography is concerned, the inadequacies of the basic climatic data, the relative significance of means, media, and extreme values, and the increasing possibility for the recognition of the same landscape units by climatologists, pedologists, and biologists, are discussed. *From author's summary.*

3566. GAUSSEN, H. Délimitation des aires de végétation selon le climat. **[The delimitation of vegetation zones according to climate.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/21/7, 1956. pp. 4. 2 refs. [F.] [Laboratoire Forestier, Toulouse.]

With special reference to the index of aridity. [Cf. *For. Abstr.* 14 (No. 3148).]

3567. TOMANEK, J. Badania nad przebiegiem skrajnych temperatur powietrza w biotopach leśnych Białowieskiego Parku Narodowego. **[Investigations on the variations of extreme air temperatures in the forest biotopes of the National Park of Białowieża.]** *Roczn. Nauk leśn.* No. 8, 1955 (179–213 + 11 gphs., 1 tbl.). 32 refs. [Pol.pol.russ.e.] (*Prace Inst. bad. Leśn.* No. 131.)

Measurements of extreme temperatures taken in 1949–51, at heights of 0·05, 0·5, 1·0 and 2·0 m., in the ground layer and at different heights in the upper storey, permit the following conclusions: (1) compared with adjacent areas in the open (op.), the 24-hour temperature amplitude was, in general, less within a forest stand; (2) this amplitude reached a maximum in the spring and for broadleaved stands (before leaf formation), sometimes exceeded the op.

amplitude; (3) In understocked single-storey stands of light-demanding species the maximum temperature was lower than in normal stands, and the amplitude increased with height, attaining its maximum value inside the crowns. All biotopes investigated can be divided into 3 groups, so far as the magnitude of mean monthly and annual amplitudes are concerned, viz. coniferous forests, broad-leaved forests, and non-forest biotopes.

3568. Obmiński, Z. Badania nad klimatem siedliskowym borów Białowieskiego Parku Narodowego. **[Investigations on the site [micro-]climate of the coniferous forests in the National Park of Białowieża.]** *Roczn. Nauk leśn.* No. 12, 1955 (3–167). 118 refs. [Pol.pol.russ.g.] (*Prace Inst. bad. Leśn.* No. 141.)

A detailed analysis of investigations on the amount of precipitation (in the open, under canopy and in gaps), variations of water-table and of air and soil temperatures at various heights and depths in 4 different types of the National Park (*Pinetum typicum*, *Piceeto-pinetum*, both on fresh, deep sandy soil; *Querceto-piceeto-pinetum*, on similar soil but with a better developed A_0 horizon; and *Pinetum turfosum* on peaty soil). The author discusses the part played by the climatic factors investigated in the totality of factors determining the productivity of these forest sites; a correlation between these factors, the composition of the vegetation, and the properties of the soils is demonstrated.

3569. Mařan, B., and Kabeláčová, E. Vliv holin a lesních porostů různé druhové skladby na mikroklima a půdu ve státně vodohospodařsky důležité oblasti Beskyd. **[Effect of clearings and stands of different composition on microclimate and soil in the state [forest] area, of Beskid, important for water conservancy.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 28 (1), 1955 (95–116). 17 refs. [Cz.cz.russ.e.]

In the spring and during thaw, the soil under Beech (*B*) and Spruce (*S*), and in clearings (*C*), was warmest at a depth of 1 m. Soil temperatures at all levels decreased in the following sequence: dense $S > B > C$. Evaporation and wind velocity were much higher in *C* than in *B*. Soil infiltration capacities were in the ratio 10/3⅓/1 (*B*/*S*/*C*). No raw-humus layers were formed in *C*. The highest soil nitrification rate was observed in *B*. During the growth period, the soil under *B* and *S* was moister than that of *C*.

3570. Miller, D. H. **The influence of open [Lodgepole] Pine forest on daytime temperature in the Sierra Nevada.** *Geogr. Rev.* 46 (2), 1956 (209–18). 20 refs. O.G.

Cf. *For. Abstr.* 17 (No. 11).

114. Soil. Soil Science

See also No. 4650.

114.1. Soil Physics

See also Nos. 3568–9, 3582, 3603, 3741.

3571. Sevim, M. Höngg civarında (Zürich) çıplak saha ve orman topraklarının bazı fisiksel vasıfları hakkında bir araştırma. **[The physical properties of forest and tillage soils on the Höngger Berg (Zürich).]** *Istanbul Üniv. Orm. Fak. Derg.* 4*A* (1/2), 1954 (38–43). [Turk.g.]

Samples of physically comparable upper soil were drawn from (*a*) a poorly grown Oak plantation established on a tillage area 25 years before, (*b*) an Oak plantation of moderate growth and (*c*) an Oak/Hornbeam stand. The pore space, field capacity by volume, and air capacity in % were respectively for (*a*) 49·9, 44·2 and 5·7; for (*b*) 51·3, 44·1 and 7·2; for (*c*) 58, 47·8 and 10·2. In (*a*) the infiltration of one litre took 85 min., under (*c*) 5 min. 1 sec. The poor growth of Oak plants in (*a*) reflects a loss in this area of pore space equal to 75 litres/cu.m. soil compared with (*c*), the air capacity of which is almost double.

3572. Tarrant, R. **Effect of slash burning on some physical soil properties.** *For. Sci.* 2 (1), 1956 (18–22). 8 refs.

A comparison of the percolation rates, macroscopic and microscopic pore space, and bulk density of a pumicy sandy loam and a sandy clay-loam from the Douglas Fir region of Washington and Oregon, when these soils (*a*) escaped a burn or were (*b*) lightly or (*c*) severely burned. Percolation was seriously lowered by (*c*) in both soils, but (*b*) did not impede water movement within the top 3 in. of soil, although macroscopic pore space was reduced. Under field conditions (*c*) is unimportant, occurring probably on $< 5\%$ of the area, and it is therefore concluded that slash burning has no serious effects on the moisture properties of the soils studied.

3573. Lull, H. W., and Reinhart, K. G. **Soil-moisture measurement.** *Occ. Pap. Sth. For. Exp. Sta.* No. 140, 1955. pp. 56. 93 refs.

Reviews current methods, describes and compares the most commonly used instruments, and discusses soil-moisture expression, variation, and sampling. Wherever possible the authors have relied on first-hand experience gained from an infiltration study carried out at Vicksburg, Miss., jointly with the U.S. Army Waterways Experiment Station.

3574. Beaucorps, G. de. Aspects de l'évolution de l'humidité des sols et forêt marocaine. **[The development of soil moisture and the Moroccan forest.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956*, No. *IUFRO*/56/21/3, 1956. pp. 5. 8 refs. [F.f.e.] [Station de Recherche Forestière, Rabat.]

Studies undertaken in Morocco have shown that soils under relatively dense forest (principally *Quercus suber*) can dry out completely to a depth of several metres during the dry season, and when this happens the rainfall during the wet season may be insufficient to replenish the soil moisture throughout the desiccated profile.

3575. Silen, R. R. **Use of temperature pellets in regeneration research.** *J. For.* 54 (5), 1956 (311–2). 5 refs.

High temperatures near the ground are a major cause of seedling mortality for many conifers.

Critical temperatures are believed to occur in a tissue-thin layer at the surface, decreasing greatly in a few mm. upwards into the air and downwards into the soil. Measurement of this thin line of surface heat with available instruments (thermometers, thermocouples etc.) is difficult and expensive, and necessarily limited to relatively few samples. Commercial temperature pellets are now available, which are in some ways superior to more expensive instruments, are cheap enough to permit extensive sampling, and provide an accurate measure of the temperature at the surface of the soil. They are in the form of tablets $\frac{7}{16}$ in. in diam. and $\frac{1}{8}$ in. thick, insoluble, distinctively coloured, generally waterproof for at least a year, easily broken to desired size, and available in useful intervals of melting temperatures (113°, 125°, 138°, 150°, and 163° F., error 1%). If a partially buried pellet is exposed to solar radiation it will begin to soften in a thin line at the soil surface when its melting temperature is reached. Should the temperature then drop, the pellet will reharden, but a thin eroded line will remain etched on its surface as a record. If the temperature continues to increase, all the portion above the surface will melt, but the part below will generally remain intact. Results of studies on natural seedbeds over 3 seasons, with many thousands of pellets, have shown them to be very useful when there is need of maximum temperature records at ca. 12° F. intervals. The method of placing the pellets, or fragments of pellets, in reference to seedlings is described in detail.

114.2. Soil Chemistry

See also Nos. 3578–85, 3591–2, 3932.

3576. HESSE, P. R. **Sulphur in soil and water [in East Africa].** *Rep. E. Afr. Agric. For. Res. Organ. 1954/55* [1955] (21–3).

The distribution of S follows a definite and apparently general pattern in the forest soils. Some S is present throughout the profile. Organic S is in greatest amount in the top soil where it accounts for most of the total S. At 2 feet, sulphate-S appears, while organic S decreases with depth, the sulphate providing most of the deep-seated S. Organic-matter content and organic S are roughly correlated. The forest biome provides an ideal system of S conservation.

3577. BIRCH, H. F., and FRIEND, M. T. **The organic-matter and nitrogen status of East African soils.** *J. Soil Sci.* 7 (1), 1956 (156–67). 20 refs. [East African Agriculture and Forestry Research Organization, Kikuyu, Kenya.]

Of 570 surface samples, 47% had more than 4% organic matter (o.m.), which compares very favourably with temperate soils. Regressions of (*a*) annual rainfall, (*b*) altitude, (*c*) mean air temperature, and (*d*) clay content, on % o.m. and total N are discussed. The soils, mainly from Kenya, were collected where (*a*) ranged from 17 to 71 in., (*b*) from 0 to 10,000 ft. and (*c*) from 54 to 80° F. Forest soils at 9000 ft. (evergreen: Kilimanjaro and Ruwenzori) are included. While (*c*) and the rate of decomposition of o.m. fall as (*b*) rises, it was found that (*a*) increases with (*b*) and is the chief factor influencing (through the vegetation it makes possible) the amounts of o.m. and N. Except for very sandy soils (*c*) and (*d*) are minor factors.

114.3. Soil Formation. The Soil Profile and its Development. Litter, Humus etc.

See also Nos. 3590, 3592, 3595, 3625, 3800–1.

3578. HATCH, A. B. **The influence of plant litter on the Jarrah [*Eucalyptus marginata*] forest soil of the Dwellingup Region—Western Australia.** *Leafl. For. Timb. Bur. Aust.* No. 70, 1955. pp. 18. 8 refs.

The average amount of litter deposited on the Jarrah forest floor in W. Australia varies between 18 and 26 cwt. (oven-dry weight—o.d.w.)/acre/annum, of which $\nless$ 50% is leaves. The fall is distributed unevenly throughout the year with the maximum occurring during January, February and March. Investigation of the development of the A_0 horizon indicates that after 23 years it amounts to 4·5–7·5 tons (o.d.w.)/acre, according to the forest canopy. Equilibrium between litter fall and litter decomposition has not yet been attained. Data are presented showing the more common inorganic constituents of the litter, and the amount of these nutrients returned to the forest floor through the litter fall is calculated. Initial investigations on the decomposition of Jarrah leaf litter show that the leaves have lost 40% of their o.d.w. 18 months after leaf fall, a loss associated with the leaching out of considerable amounts of the inorganic constituents of the leaves. Data are presented showing the influence of the plant litter on the forest soils. The humus formed from the litter is mildly acid, and the organic-matter level of the surface soil largely governs the cation exchange capacity of the A_1 horizon. Considerable increases in water-soluble Ca and Mg have been noted in the surface soil, owing to the leaching of the litter on the forest floor by the early winter rains. [Cf. *For. Abstr.* 17 (No. 3595).] *From author's summary.*

3579. CLAUDOT, J. E. Influence de l'*Eucalyptus* sur l'évolution des sols au Maroc. **[The influence of Eucalypts on the evolution of soils in Morocco.]** [*Docum.*] *2nd Sess. Working Party on Eucalypts FAO Jt. Subcomm. Medit. For. Probl., Nice 1956* No. *FAO/SCM/EU/7–B*, 1956. pp. 2. 1 ref. [F.]

Describes the lay-out of experimental plots in the Rharb, designed to investigate the reasons for the very slight humification of these sandy soils under Eucalypts, in spite of an annual deposition of litter amounting to 0·5 kg./sq. m. Preliminary results indicate that cellulolytic bacteria are numerous and active, but there is a complete absence of nitrifying bacteria. Upper horizons have a high C/N ratio. [Cf. *For. Abstr.* 16 (No. 1509).]

3580. BEAUCORPS, G. DE. Orientation des travaux de recherche et premiers résultats concernant l'évolution de la matière organique sous les boisements d' *Eucalyptus* du Rharb (Maroc). **[The lay-out and first results of research projects on the evolution of organic matter in the soil under Eucalypt plantations of the Rharb (Morocco).]** [*Docum.*] *12th*

Congr. int. Union For. Res. Organ, Oxford 1956 No. *IUFRO*/56/21/12, 1956. pp. 12. 5 refs. [F.f.e.]

Describes experiments begun in 1955 on a series of plots under high Eucalypt plantations, 8- to 10-year coppice, and in open heathland. The following are measured monthly: pH of different horizons, content of exchangeable bases, quantity of mineral N, quantity of N mineralizable in the oven at 30° C. [cf. *For. Abstr.* 13 (No. 1818)]. Other objects are the determination of the C/N ratio, the fulvic-acid/humic-acid ratio, and ammonifying and nitrifying capacity. Preliminary findings indicate that pH is subject to important seasonal fluctuations ranging from 4·1–5·2 in June to 6–7 in January or February. The oven tests of N mineralization showed that the upper horizons, which have a high C/N ratio ($\geqslant 40$) are only very slightly activable in test conditions. Nitrification is feeble throughout the profile. [Cf. *For. Abstr.* 16 (No. 1509).]

3581. WRIGHT, T. W. **Profile development in the sand dunes of Culbin Forest, Morayshire. II. Chemical properties.** *J. Soil Sci.* 7 (1), 1956 (33–42). 12 refs. [Macaulay Institute of Soil Research, Aberdeen.]

From samples drawn from the same plots [see *For. Abstr.* 17 (No. 1129)] it is shown that considerable redistribution of the major nutrients has taken place after dune fixation. The distinction between the downward leaching and the circulation initiated by the tree crop is also brought out by analysis. Abnormal seasonal variations in the chemical content of the litter are also shown.

3582. OVINGTON, J. D. **Studies on the development of woodland conditions under different trees. IV. The ignition loss, water, carbon and nitrogen content of the mineral soil.** *J. Ecol.* 44 (1), 1956 (171–9 + tbl.). 4 refs.

An account is given of the resultant changes in soil properties, both physical and chemical, after periods of afforestation up to 45 years at each of 3 localities [cf. *For. Abstr.* 16 (No. 2605)] where a number of diverse forest plots have been established. The % volumes of soil, water, and air in the soil mass and the %s of ignition loss, C and N of the mineral soil [data tabulated] are all modified to varying degrees down the soil profiles according to the type of tree species established and the general site factors of the locality. Changes in the physical soil conditions may be in part a result of the type of associated ground flora. By the selection of tree species for establishment it is possible in time to modify the soil, and more particularly the total weights of C, N, and organic matter in the soil. Detailed measurements of various tree stands gave no evidence that the differences in soil conditions could be directly related to differences in plantation growth as measured by productivity of dry matter. For example, the trees of *Alnus incana* at West Tofts contain a relatively large amount of N, but there is no evidence of depletion of N from the soil under this stand. The general tendency is for woodland soils to contain more C and N than comparable non-woodland soils, more soil C being present under conifers than under hardwoods; differences in soil N are not as great. The amounts of C and N in the litter are considerable, but the total amounts in the soil as a whole are not great when compared with those in the trees. The accumulation of C and N in the tree crop is attained without any decrease in the soil C and N.

3583. BLOOMFIELD, C. **The movement of sesquioxides and clay in the soil.** *Sols Africains, Paris* 3 (4), 1956 (488–506). 29 refs. [F.E.]

Reviews and discusses recent work, published or still in the press, on the reduction or loss of iron compounds and the movement of clay in the formation of gleys and podzols. Graphs include the solution-reduction of ferric salts by leaf extracts and the deflocculating effect on kaolin of leaf leachates of two species of *Dacrydium*, Kauri (bark leachate also), Scots Pine, Aspen, and Larch. [Cf. *For. Abstr.* 17 (Nos. 1141–2).]

3584. LOSSAINT, P. Solubilisation de fer dans un sol par les extraits aqueux stériles de litières de charme et de pin silvestre. **[The ability of sterile aqueous extracts of Hornbeam and Scots Pine litter to dissolve iron in the soil.]** *C.R. Acad. Sci., Paris* 239 (2), 1954 (187–9). [F.f.] O.R.S.

In laboratory experiments aqueous solutions of litter of *Pinus sylvestris* and *Carpinus betulus*, collected from the forest of Herrenwald, liberated Fe_2O_3. Amounts liberated by *C. betulus* were considerably the larger.

3585. LOSSAINT, P. Étude comparative de la solubilisation des oxydes de fer d'un sol par les extraits aqueux stériles de litières forestières. **[Comparative study of the ability of sterile aqueous extracts of forest litters to dissolve iron oxides in the soil.]** *C.R. Acad. Sci., Paris* 242 (8), 1956 (1052–4). 2 refs. [F.f.] O.R.S.

Cold- or hot-water extracts of litter collected immediately after leaf-fall from *Quercus robur*, *Q. rubra*, *Fagus sylvatica*, *Betula verrucosa*, *Carpinus betulus*, *Alnus glutinosa*, *Acer platanoides*, *Abies alba*, *Picea abies*, *Pinus sylvestris* and *Calluna vulgaris* were used in laboratory experiments. Generally speaking the extracts of litter from broadleaved species released more Fe_2O_3 than those from conifers, amounts being highest for *Q. robur* and *Q. rubra* (142 and 115·5 mg. Fe_2O_3 respectively in the extract from 100 g. litter). A close correlation was found between the presence of tannins and of titratable acids and ability to dissolve iron oxides.

3586. PELÍŠEK, J. Nové vyzkumy o vzniku podzolových půd v lesních oblastech střední Evropy ve vztahu k biologii lesa. **[New investigations into the origin of podzol soils in the forest regions of Central Europe in relation to forest biology.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 28 (4), 1955 (479–92). [Cz.cz.russ.e.g.]

Podzol formation of 3 independent types can be distinguished in Czechoslovakian forest regions: (1) in lowlands and hills under broadleaved forests, associated with low precipitation and a relatively high mean temperature; (2) podzolization resulting in extreme degradation of soil under pure Spruce or Pine in the same areas; and (3) at high altitudes, associated with high precipitation (900–1200 mm.)

and low mean annual temperature (3–6° C.), under predominantly Spruce forest.

3587. STEPHENS, E. P. **The uprooting of trees: a forest process.** *Proc. Soil Sci. Soc. Amer.* 20 (1), 1956 (113–6). 7 refs. O.R.E.

Discusses uprooting, whether by wind, ice, disease or old age, as part of the process of forest development, with particular reference to its effects on the soil, in the light of a detailed survey of ca. 1 acre in Harvard forest involving its history for the past 500 years. This showed evidence of 4 major periods of uprootings, resulting in a total area of 'pits and mounds' of > 5000 sq. ft., i.e., almost 14% of the area surveyed. [Cf. *For. Abstr.* 17 (No. 3741).]

114.4. Soil Classification. Soil Types

See also Nos. 3583–6.

3588. FERDA, J. Půdní průzkum oblasti hospodářského celku Klínec. **[Soil investigations in the Klínec [forest] management unit.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 28 (4), 1955 (521–72 + 1 map). 32 refs. [Cz.cz.russ.g.]

The 16 soil types or varieties that occur are described in detail.

3589. GETHIN JONES, G. H. and SCOTT, R. M. **Soil survey [of East Africa].** *Rep. E. Afr. Agric. For. Res. Organ 1954/55* [1955] (27–35). 1 ref.

Includes 'The classification of East African soils: first tentative list of great soil groups (1–27) arranged under soil sub-orders (A–L).'

3590. GRANTHAM, D. R., and PILSON, R. D. **The geology and ecology of the Nachingwea Region: a reconnaissance survey of topography, soils, vegetation and geology in the southern provinces of Tanganyika.** *Bulletin, Geological Survey Department, Dar es Salaam, Tanganyika* No. 26, 1955. pp. 33 + 3 plates + 4 maps. 6 refs.

Includes sections on: soil formation, description and distribution; ecology (including some tree habitats); field classification of soils and vegetation; and geology.

114.5. Soil Fertility. Soil Toxicity. Soil Depletion and Exhaustion

See also Nos. 3750–2, 4259, 4298–4304, 4307–10.

3591. SCHÖNHAR, S. Untersuchungen über das mengenmässige Auftreten von Nitrat und Ammoniakstickstoff in Böden verschiedener Waldstandorte. Ein Beitrag zur Frage der Beziehungen zwischen der floristischen Zusammensetzung der Bodenflora und den chemischen Bodenfaktoren. **[Quantitative occurrence of NO_3-N and NH_4-N in soils of different forest stands. A contribution to the problem of relationship between the ground flora and soil chemistry.]** *Forstwiss. Cbl.* 74 (5/6), 1955 (129–45). 12 refs. [G.g.] [Forstliche Versuchsanstalt, Stuttgart.]

In the lowlands of Württemberg, soils of the following forest stands were examined: (1) Oak/Beech on acid soils; (2) Spruce stands in the region of (1); (3) Oak/Beech on slightly acid soils. The 3 types of forest showed wide divergencies in NO_3-N and NH_4-N contents of the soils. Highest quantities of both (and in particular of NO_3-N) were found in (2); (3) and (1) follow in descending order. NO_3-N is found only in very small quantities in (1). The results suggest that the more exacting species in the ground flora of (2), in spite of the unfavourable soil reaction, can hold their own in competition with acidophilous species because of the abundant supply of mineral N, particularly of NO_3-N. [Cf. *For. Abstr.* 14 (No. 2993).]

114.6. Soil Biology

See also Nos. 3579, 3710–4, 3932, 4145.

3592. SEIFERT, J., and KOTOUNOVÁ-HANZALOVÁ, L. Vliv okrajové seče na mikrobiologické procesy v lesní půdě. (Předběžne sdělení.) **[Effect of progressive clear-strip fellings on microbiological processes in forest soil.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 28 (1), 1955 (75–84). 4 refs. [Cz.cz.russ.]

A comparison of the soil under old Beech/Oak forest with that under herbaceous vegetation on the adjacent felled strip [width not given] showed that the former was characterized by better mineralization but poorer humification than the latter.

3593. MURPHY, P. W. **Ecology of the fauna of forest soils [with discussion].** *Repr.* from *Soil Zoology: Proceedings of the University of Nottingham Second Easter School in Agricultural Science, 1955.* Butterworths Scientific Publications, 88 Kingsway, London W.C.2. [1956?] (99–124). 58 refs. [Rothamsted Experimental Station, Harpenden, Herts.]

A survey of present knowledge on the meso- or meio-fauna and to a lesser extent the macrofauna of mull and mor forest soils, with particular reference to population structure and the mutual influence of environment and fauna.

3594. MURPHY, P. W. **Note on processes used in sampling, extraction and assessment of the meiofauna of heathland.** *Repr.* from *Soil Zoology.* [*Proceedings of the University of Nottingham Second Easter School in Agricultural Science.*] Butterworths Scientific Publications, 88 Kingsway, London W.C.2. [1956?] (338–40). [Rothamsted Experimental Station, Harpenden, Herts.]

The sampling method used consists in taking blocks of litter, raw humus and soil, and cutting cores from them, which are placed undisturbed in extraction funnels. The method will be described in more detail elsewhere.

3595. MCNAMARA, P. J. **A preliminary investigation of the fauna of humus layers in the Jarrah [*Eucalyptus marginata*] forests of Western Australia.** *Leafl. For. Timb. Bur. Aust.* No. 71, 1955. pp. 16. 9 refs.

To determine the possible relationships between the nature and abundance of the soil microfauna and forest humus types, populations were sampled in: (1) The surface layer of a protected compartment and an annually burnt firebreak; (2) a protected compartment and an annually burnt firebreak at various depths below the ground; (3) an area suffering from crown deterioration, giving rise to four distinct cover types. In all cases the microfauna was found to be more abundant in numbers and types in zones of accumulated organic matter. Provided that similar extraction methods were used, the populations were found to be comparable with those found in similar types of humus overseas (pH 5·8–6·2) at 41·40–64·40 millions/acre. Faunistic composition was fairly constant (87–89% mites and springtails) despite these variations in total population.

Factors governing population fluctuations and the role of the microfauna in the maintenance of forest fertility, by the annual destruction of 10–15% of the annual leaf fall, are briefly discussed. [Cf. *For. Abstr.* 17 (No. 3578).] *From author's summary.*

116. Hydrology. Water Conservation, Soil Conservation and Erosion

See also Nos. 3563–4, 3569–70, 3771, 3809, 3903, 3914–5, 3918, 3920–4, 4651.

3596. MÜLLER, A. Grundriss der forstlichen Wasserwirtschaft. **[Outlines of forest water management.]** Deutscher Bauernverlag, Berlin. 1955. pp. 72. 20 refs. [G.] Price *DM.*2·30.

A short exposition, for the practical forester, of the main principles of hydrology and related questions, e.g. the influence of vegetation on stream-flow, run-off and water-table, with practical hints on draining and irrigation, the upkeep of banks, torrent control, hygiene, legal aspects, etc.

3597. KIRWALD, E. Über Wald und Wasserhaushalt im Ruhrgebiet. **[The forest and the water regime in the Ruhr.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956*, No. *IUFRO*/56/11/14, 1956. pp. 6 + 9 gphs. + 1 map + 1 photo. [G.]

Reviews 3 years' meteorological and hydrological data for 7 recording stations in the area and stresses the importance of maintaining adequate forest cover to prevent erosion, flooding, etc.

3598. WICHT, C. L. **Hydrological research in Southern Africa.** *Sols Africains, Paris* 3 (4), 1956 (444–87). 112 refs. [F.E.f.e.]

Hydrological research is separately reviewed for each of the territories south of and including the Belgian Congo and the Central African Federation, and some methods and instruments are recommended. The urgent need for the improvement and expansion of hydrological surveys is stressed, including greater co-ordination within and outside a territory, better training for field observers, standardization of main techniques and comprehensive investigations of the hydrological cycle.

3599. ROSA, J. M. **Forest snowmelt and spring floods.** *J. For.* 54 (4), 1956 (231–5). [U.S. Forest Service, Intermountain Region, Ogden, Utah.]

Hydrographs are developed for some of the factors that influence snow storage and melting, in an extension of previous information [see *For. Abstr.* 13 (No. 1833)]. The illustrated procedures make it possible to estimate the probable effects of forests on spring flows.

3600. SHIRAI, J., and NAKANO, H. **On the effects of the gradual worsening of the forest cover upon the trend and the uniformity of stream flow.** [*Docum.*] *12th Congr. int. Union For. res. Organ., Oxford 1956* No. *IUFRO*/56/11/11, 1956. pp. 2.

Observations on two small catchments maintained since 1937 and clear felled (of *Pinus densiflora*) ca. 1942 show a gradual increase in run-off but not in evaporation, since 1945. [Cf. *For. Abstr.* 15 (No. 3220).]

3601. SMITH, J. L. **Some effects of vegetal cover upon the hydrology of watersheds at East Lansing, Michigan.** *Abstr. of thesis* in *Dissert. Abstr.* 16 (3), 1956 (424). [Michigan State University.] O.R.S.

The clear felling already reported [see *For. Abstr.* 14 (No. 35)] resulted in increased soil moisture the following year, and run-off in Aug. 1952. The only other August run-off during the 11-years observation period occurred in a year of abnormal rainfall.

3602. **Increasing water yield by cutting forest vegetation.** *Rep. Stheast. For. Exp. Sta. 1955*, 1956 (43–6).

Presents some revised and some new data from the Coweeta experiments. [Cf. *For. Abstr.* 13 (No. 3578).]

3603. KÖHN, M. Untersuchungen zur Frage des Wasserhaushaltes von Böden. **[Research [in Germany] on the water economy of soils.]** *Z. PflErnähr. Düng.* 72 (2), 1956 (136–51). 10 refs. [G.g.] O.R.S.

Measurements on plots with no vegetation, under pasture, and under a 50-year Douglas Fir stand, during July and August 1954, at different depths, showed that: (1) drying of surface layers of soil is more rapid on bare sites; (2) drying of deeper layers is more rapid on sites with vegetation than on bare sites; (3) pasture sites dry more rapidly and completely than forest soils; (4) forest soils at a depth of 20 cm. dry more completely than layers above or below, as a result of water consumption by the ground flora; (5) the penetration of rain into the soil is influenced by a number of factors, e.g. interception by tree crowns. Further research is desirable.

3604. POUPON, J. L'amenuisement des superficies cultivées sous l'effet de l'érosion dans la région du Betsiriry. **[The wastage of cultivated land by erosion in the Betsiriry region [of Madagascar].]** *Bois For. Trop.* No. 46, 1956 (11–5). [F.e.span.]

Emphasizes the dangers of erosion and deposition of silt when riverside fringing forest is cut in the tropics and the land cultivated, with an illustrative example from Madagascar.

3605. **Gullied Piedmont lands can be quickly stabilized.** *Rep. Stheast. For. Exp. Sta. 1955*, 1956 (46).

Describes and illustrates rehabilitation of a severely gullied old field by levelling with a bulldozer and sowing with grasses after fertilizing, and applying a light Pine-twig mulch. Loblolly Pine is to be planted later.

3606. **[Forests and water management in mountainous areas.]** *Sylwan* 99 (3), 1955 (199–268). [Pol.]

Nearly the whole issue deals with this subject. The titles of the articles are: (1) Share of forestry in the water economy of the country (*W. Novák*); (2) Climatological and hydrological role of forests (*J. Tomanek*); (3) Management of torrent and mountain river catchments from the standpoint of run-off control (*L. Kulig*); (4) Trends of agricultural production in connexion with the planning of water management in mountains (*K. Figuła*); (5) Problem of water management in mountain areas from the standpoint of nature protection (*J. Fabijanowski*); (6) Revetting of mountain torrents (*T. Klus*); (7) Principles of planning the biological [vegetational] revetting of mountain rivers and torrents (*M. Dąbrowski*); (8) Minutes of the conference (Żywiec, 23–25 Aug. 1954) on problems of water management in mountains.

3607. VESELÝ, V. Důležitost zvláštní péče o les a půdu ve sběrných oblastech bystřin. **[Importance of special care of forests and soil in torrent catchments.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 28 (3), 1955 (393–406). 14 refs. [Cz.russ.g.]

Instancing the damage observed in the Roztoki area near Křivoklat (Czechoslovakia), the author discusses its causes and recommends the following measures: (1) improving water retention by substituting group for uniform fellings; (2) afforestation of all clear-felled and thinly stocked areas; (3) care not to injure the soil during felling; (4) gully revetment; (5) systematic tending of stands bordering torrents; (6) maintenance of a clear torrent-bed and (7) planning roads so that they do not obstruct run-off.

3608. WIDMANN, E. M. E. **Protection against sedimentation [from torrents] of large reservoirs.** [*Docum.*] *3rd Sess. FAO European For. Comm. Working Party on Torrent Control, 1956* No. *FAO/EFC/TORR*/6, 1956. pp. 18. 28 refs.

Discusses the hydrological, ecological, and economic factors to be taken into consideration before planning large-scale protective measures.

14. Systematic Zoology

145.7. Insecta. Entomology

See also Nos. 3740, 4134 *et seq.*

3609. MATHUR, R. N. **Identification of Indian Lyctidae and *Dinoderus* species.** *Indian For. Bull.* (*n.s.*) No. 187, 1955. pp. 8 + 1 set of drawings. 27 refs.

Gives the distinguishing characters of 12 Indian Lyctidae of several genera and 8 *Dinoderus* spp.

3610. CHAPMAN, J. A. **Flight-muscle changes during adult life of a scolytid beetle.** *Nature, Lond.* 177 (4521), 1956 (1183). 4 refs. [Forest Biology Laboratory, Victoria, B.C.]

Observations on *Trypodendron lineatum* showed a temporary, but marked, reduction in size of flight muscles during brood establishment, followed by return to normal size and, apparently, function.

3611. DELUCCHI, V. Neue Chalcidien aus dem Belgischen Kongo. **[New chalcids from the Belgian Congo.]** *Rev. Zool. Bot. afr.* 53 (1/2), 1956 (158–78). 6 refs. [G.] [European Laboratory, Commonwealth Institute of Biological Control, Zürich.]

Seven new species (1 new genus) are described. All were bred from Coleoptera except 2 from unknown hosts in infested seed of *Celtis* and *Berlinia*.

15. Animal Ecology. Game and Fish Management, Hunting, Shooting and Fishing

See also Nos. 4006, 4121 *et seq.*

3612. MEHLHARDT, D. Die Jagdgesetzgebung in der Sowjet-Union und den Volksdemokratien. **[Game laws in the U.S.S.R. and the peoples' democracies.]** *Wald* 3 (12), 1953 (368–70). [G.]

Includes some figures on the introduction of valuable fur species into European Russia, and Polish regulations on maximum stocking (red deer 3–4/1000 ha., in coniferous, 6–7 in mixed, and up to 12 in broadleaved forests) and describes their system of compulsory state insurance against game damage. No other country is mentioned.

3613. SODY, H. J. V. Enkele opmerkingen over vogelcultuur op Java in het algemeen en over vogelplanten in het bijzonder. **[The maintenance and increase of bird populations in Java with particular reference to bird plants.]** *Madj. Ilmu Al. unt. Indones.* 111 (4/6), 1955 (178–96). [Du.] E.M.B.

Discusses briefly the essentials for encouraging bird life (food, water, nesting sites, security) and lists, with comments, plants considered attractive to birds. These include some 40 trees, chiefly those visited for their fruits or for nectar from the flowers.

3614. MELZER, G. Schafft Fasanenschutzgehölze. **[Establish protective woodlands for pheasants.]** *Wald* 3 (3), 1953 (80–3). 8 refs. [G.]

Discusses the role of pheasants, partridges, etc. in the biological control of agricultural and forest pests, and urges the establishment of suitable copses, windbreaks and hedges in Saxony to create favourable ecological conditions.

3615. PALMAR, C. E. **The capercailzie. [*Tetrao urogallus*.]** *Leafl. For. Comm., Lond.* No. 37, 1956. pp. 10.

Notes on history, present distribution, habitat, food, breeding, damage to plantations, and control.

3616. **Myxomatosis in rabbits.** [*Pap.*] *6th tech. Mtg. int. Union Prot. Nature, Edinburgh 1956* No. *IUPN/A.G.5/R.T.*6/II/2, 1956. pp. 5.

A summary account of the ecological effects of the disease, prepared by FAO.

3617. RATCLIFFE, F. N. **The ecological consequences of myxomatosis in Australia.** [*Pap.*] *6th tech. Mtg. int. Union Prot. Nature, Edinburgh 1956* No. *IUPN/A.G. 5/R.T.*6/II/7, 1956. pp. 12. [C.S.I.R.O., Canberra.]

3618. MARTIN, P. S. **Zonal distribution of vertebrates in a Mexican cloud forest.** *Amer. Nat.* 89 (849), 1955 (347–61). 32 refs. [University of Michigan.] O.R.S.

An examination of the cloud forest at its northern limit in E. Mexico showed (1) a small distinctive forest habitat, humid and mild, with only slight seasonal variations; (2) a flora containing genera with both temperate and tropical centres of distribution, richer than that of many areas further south; (3) a vertebrate fauna derived almost entirely from adjacent forest habitats and lacking most indigenous forms typical of cloud forest further south. *From author's summary.*

3619. SCHANTZ, H. L. **Big game populations of the National forests [of the U.S.A.], 1921 to 1950.** *For. Sci.* 2 (1), 1956 (7–17). 10 refs.

Includes tabulated data from the 1920 and 1950 censuses and discusses fluctuations in the deer, elk and antelope populations in relation to the available range.

3620. WESTELL, C. E., JR. **Ecological relationships between deer and forests in Lower Michigan.** *Proc. Soc. Amer. For. 1955*, 1956 (130–2). 6 refs.

Summarizes the results of studies on the effect of deer browsing on Aspen regeneration, and game management in Michigan.

3621. HUESTIS, E. S. **The effects of logging old-growth timber on big game.** *Proc. Soc. Amer. For. 1955*, 1956 (123–4).

A short review of the subject.

3622. SCHNEIDER, P. W. **The effects of logging old-growth timber on fish management.** *Proc. Soc. Amer. For. 1955*, 1956 (121–3). 5 refs.

A short review of the subject.

16. General Botany

160. Plant Chemistry

See also Nos. 3582, 3627, 3668, 4108, 4217–9, 4417 *et seq.*, 4513, 4586 *et seq.*

3623. GOODWIN, T. W. **Studies in carotenogenesis. 19. A survey of the polyenes in a number of ripe berries.** *Biochem. J.* 62 (2), 1956 (346–52). 33 refs. O.R.S.

Including berries of *Crataegus* spp., *Sambucus nigra, Sorbus aucuparia* and *Taxus baccata.*

3624. HAYASHI, K., and ABE, Y. Studien über Anthocyane. XXVII. Papierchromatographische Übersicht der Anthocyane im Pflanzenreich (II). Farbstoffe des roten Herbstlaubes. **[Studies on anthocyanins. XXVII. A paper-chromatographical study and review of the anthocyanins in the autumn colouring of leaves.]** *Bot. Mag., Tokyo* 68 (809), 1955 (299–307). 7 refs. [G.g.] I.M.I.

[Cf. *For. Abstr.* 15 (No. 2285).] Tabulates for 74 species (25 families, including many trees and shrubs) that provide the most beautiful autumn colouring of the mountains of central Japan, the leaf colour, location in leaf tissue, the anthocyanins here isolated and references to others previously published. In spite of colour differences, the anthocyanin constitution is simple. The autumn colouring is chiefly due to cyanidinmonoglucoside or chrysanthemin. Exceptions are found in the added presence in Ericaceae of a delphinidin derivative and in Anacardiaceae and Vitaceae of a paeonidin-glucoside.

3625. BENDZ, G. **Gallic acid isolated from water extracts of litter from *Acer platanoides*.** *Physiol. Plant., Copenhagen* 9 (2), 1956 (243–6). 8 refs. [Chemical Institute, University of Uppsala.]

Gallic acid has been isolated from litter extracts of *A. platanoides.* It has low activity when tested against *Staphylococcus aureus*, but the activity is increased when gallic acid is neutralized with alkali. *From author's summary.*

161. Physiology

See also Nos. 3658, 3702 *et seq.*, 3996, 4052, 4056, 4060, 4072, 4108, 4513–4.

3626. HÄRTEL, O., and EISENZOPF, R. Zur Physiologie und Ökologie der kutikulären Wasseraufnahme durch Koniferennadeln. **[The physiology and ecology of water absorption through the cuticle of conifer needles.]** *Zbl. ges. Forst- u. Holzw.* 72 (1), 1953 (47–59). 23 refs. [G.g.]

The water absorption and transpiration through the cuticle, measured in terms of % of water content of fresh needles, was tested for needles of *Picea abies, P. omorika, Pinus sylvestris* and *Abies cephalonica.* Shade needles absorbed more water than sun needles, and young needles more than old, maximum capacity being reached at 2 years. Water absorption increased with height position on the stem and apical position on branches. Both absorption and transpiration capacity were lowest in winter and highest in summer, but the absorption/transpiration ratio was low in summer and high in winter when the needles could replace most of the water lost through cuticular absorption. The significance of this fact for the water regime of the tree under unfavourable conditions is discussed. No cuticular absorption of water in vapour form could be observed. [Cf. *For. Abstr.* 14 (No. 3031).]

3627. MOROZOV, V. F. Napravlennostj uglevodnogo i belkovogo obmenov u duba čereščatogo različnyh èkotipov. **[The carbohydrate and protein metabolism of different ecotypes of Pedunculate Oak.]** *Dokl. Akad. Nauk SSSR* 105 (3), 1955 (588–91). 11 refs. [Russ.] A.P.B.

Gives the results of studies in 1954 on leaves of *Quercus robur* from 3 types of Oakwood in the Belorussian Poles'e, viz. (1) Oak/Ash on the best site (moist, heavy, humous soil), (2) Oak with *Aegopodium podagraria* on an intermediate site, and (3) Oak with bracken on the poorest (dry, light sand or sandy loam, poor in humus). Early-flushing forms predominate in (1) [and late flushers in (2) and (3)?]. Analyses of leaf carbohydrates at different times of day are tabulated for (*a*) 23–29 June and (*b*) 10–16 Aug. The daily means for content of monosaccharoses (% based on o.d. weight), for the 3 types respectively, were (*a*) 0·78, 1·78, 1·9, and (*b*) 1·36, 1·43, 1·51; and the corresponding disaccharose/monosaccharose ratios were (*a*) 3·1, 1·7, 2·4, and (*b*) 2·7, 3·0, 3·8. Determinations of moisture content during (*a*) showed that leaves of the early-flushing form in (1) contained 10–30% more water at

1–2 p.m., and > 40% more in the morning and evening, than those of late-flushing forms in (3); figures for (2) were intermediate.

Data are also given for contents of protein and non-protein N in the protein fractions soluble in water, salt and alkali solutions. These indicate that there is a greater accumulation of the high-molecular fractions in the late flushers of (2) and (3), whereas the simpler proteins predominate in early flushers of (1). A moderate decrease in total protein N, a very marked decrease in the N of water-soluble proteins, and some increase in non-protein N occur in passing from (1) to (3). Results for periods (*a*) and (*b*) were similar in this case. A final table compares the mono- and disaccharose contents and hydrolytic activities in 1-year shoots of early flushers in (1) and (3) and a late flusher in (2), in early April and mid-October. At both of these times the early-flushing forms had higher mono- and lower disaccharose contents, and a much higher hydrolytic activity, than the late flusher. It is concluded that soil moisture appears to be very important not only in its direct physiological role, but also in its effect on the occurrence of the different forms of Oak.

3628. **Gum exudation pressure measured.** *Rep. Stheast. For. Exp. Sta. 1955*, 1956 (32).

Describes an apparatus consisting of a hypodermic needle attached to an empty capillary glass tube, sealed at the end. The needle is inserted into the outer rings of the sapwood, and the compression of the air in the tube caused by the exuding resin is measured.

3629. CHAMPAGNAT, P. Recherches sur les 'rameaux anticipés' des végétaux ligneux. [**'Proleptic' branching in woody plants.**] *Revue de Cytologie et de Biologie Végétales, Paris* 15 (1), 1954 (1–54 + 8 plates). 40 refs. [F.f.] L.S.

'Proleptic' branches, according to the author, are the result of the development of lateral buds in the presence of an intact main shoot. They are distinct from lammas shoots in that they do not appear at any definite stage of the tree's growth, and they are found more frequently on young trees, becoming rarer as the trees approach maturity. Results are presented of a study of the formation of such 'proleptic' shoots, and it is concluded that 3 factors are involved, viz. the internal auxin pattern, the vigour of the parent shoot, and the progressive development of dormancy in the lateral buds.

3630. BARLOW, H. W. B., and HANCOCK, C. R. **Internode growth in stoolbed shoots of the Apple rootstock Crab C.** *Rep. E. Malling Res. Sta. 1954/55*, 1956 (89–100). 16 refs.

Experiments on vegetative shoots are described in which various parts were excised in order to assess their influence on elongation of the internodes. Removal of the tip (the terminal cluster of very small leaves enclosing the apical meristem) reduced the extension of the first internode below, without greatly affecting the second. Removing the leaves below the tip (1 and 2, or 1 to 4 inclusive) led to further restriction in the lengths of these two internodes, but the effect was not much increased by taking off additional leaves. The reduction in final internode length is the result of a lower growth rate after treatment rather than an earlier cessation of growth. The effect of the tip was analysed by removing the very small leaves therein, either as they attained a particular stage of development, or in groups at one time. Removal, by either method, profoundly affected the final lengths of the internodes near by, increasing the length of the internode just below the treated zone, and decreasing the lengths of those in, and just above it. Development of the axillary buds was brought about by excising the small leaves, to an extent more or less proportional to the number of leaves removed. Certain defoliation treatments affected the size of the leaves below and/or above the treated zone. The results are discussed in terms of the supply of growth substances and food materials to the extending internodes. *Authors' summary.*

3631. GREBINSKIĬ, S. O., LJUKOVA, L. A., and FRIŠKO, K. N. Vlijanie vitaminov na raspuskanie pokojaščihsja poček. [**The influence of vitamins on the flushing of dormant buds.**] *Dokl. Akad. Nauk SSSR* 105 (6), 1955 (1361–3). 4 refs. [Russ.] A.P.B.

In Nov.-Dec. of the years 1947–54 experiments were made on cut branches of various woody species, including *Fraxinus excelsior*, *Quercus sessiliflora* and *Tilia cordifolia*, brought indoors and kept at 25–30°C. In all species tested, direct injection of the dormant buds with aqueous solutions of thiamin (vitamin B_1) or nicotinic acid (PP), generally at a concentration of 1γ/ml., considerably hastened flushing as compared with controls injected with distilled water. In special trials, 1 or 10γ/ml. of B_1 proved equally effective, but 100 γ/ml. damaged or killed the buds. No difference in effect was found between B_1 and its hydrochloride. Both B_1 and PP were greatly more effective than 1% acetylene in breaking dormancy. Injection of B_1 was shown to stimulate respiration, but the physiological action of the vitamins requires further study.

162. Pathology. Teratology

See Nos. 3657, 3667.

163. Embryology

3632. **Study of Pine reproductive structures.** *Rep. Sth. For. Exp. Sta. 1955* [1956] (10, 12).

Meiotic division of microsporogenesis in Longleaf Pine occurred when the ♂ cones were 13–16 mm. long (in 1955, in February). The same state in megasporogenesis occurred when the ♀ cones were 19–23 mm. long (in 1955, between March 25 and April 15); ♀ cones ceased elongation at 30–35 mm. Archegonia were observed late in April in second-year cones 81–105 mm. long.

3633. DNYANSAGAR, V. R. **Embryological studies in the Leguminosae. XI. Embryological features and formula and taxonomy of the Mimosaceae.** *J. Indian bot. Soc.* 34 (4), 1955 (362–74). 37 refs. O.B.D.

Cf. *For. Abstr.* 16 (No. 3790).

3634. RAO, A. N. **Life-history of *Shorea robusta* Gaertn.** *Curr. Sci.* 25 (4), 1956 (128–9). 4 refs. A.P.B.

A brief account of the embryogeny of *S. robusta*.

164. Morphology

See also Nos. 3667, 3692, 4052, 4391, 4395.

3635. FREEMAN, G. H., and BOLAS, B. D. **A method for the rapid determination of leaf areas in the field.** *Rep. E. Malling Res. Sta. 1954/55*, 1956 (104–7). 7 refs.

Describes the construction and use of a grid for rapidly estimating the area of individual leaves in the field. It is applicable to all leaves that are approximately elliptical in shape.

3636. PIKE, K. M. **Pollen morphology of Myrtaceae from the south-west Pacific area.** *Aust. J. Bot.* 4 (1), 1956 (13–53 + 1 plate). 26 refs. O.B.D.

Deals with pollen grains of 300 species of 71 genera of Myrtaceae, mainly occurring in the S.W. Pacific area. A provisional key to pollen grains of the genera examined is included. *From author's summary.*

165. Phylogeny, Evolution. Heredity, Genetics and Breeding: Variation

See also Nos. 3627, 3681, 3841–7, 3850, 3988, 4151, 4201, 4651.

3637. ERNST, W., JANSON, F., MEYER, A., and SCHMITT, R. Züchtung schnellwachsender Baumrassen in Schweden. **[Breeding fast-growing races of trees in Sweden.]** Verlag Kommentator G.m.b.H., Frankfurt/Main. 1954. pp. 68 + 1 chart. [G.g.] (FAO Extended Technical Assistance Project No. 53/16.) X.

Report on a study tour, describing the history and organization of tree breeding in Sweden and the work done, chiefly selection of genetic material, techniques, and quantitative results to date. Swedish methods, based on a comparatively small number of native races and gradually changing climatic conditions, cannot be taken over uncritically in Germany, where conditions are much more complex both as regards the number of native and exotic races and the diversity of soil and site conditions. Recommendations for Germany include the concentration of tree breeding at, or under the supervision of, state research institutes, and draft proposals for the certification of plus-trees and the future classification of seed from seed orchards.

3638. HOUTZAGERS, G., and STRAATEN, L. E. VAN. **Organization of forest tree improvement in the Netherlands and research on vegetative propagation at the Institute for Forest Research of the Agricultural University, Wageningen.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956*, No. *IUFRO*/56/22/5, 1956. pp. 3. [E.g.]

3639. DORMAN, K. W. **Publications on forest genetics.** *Sta. Pap. Stheast. For. Exp. Sta.* No. 63, 1956. pp. 18. 90 refs.

A list of titles on genetics and allied subjects, each with a short indicative abstract, published by station staff between 1939 and 1955.

3640. HYUN, S. K. **Forest tree breeding in Korea.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/22/21, 1956. pp. 10. [Seoul University, Korea.]

Work is at present concentrated on improving *Pinus rigida*, *P. taeda* and a number of Poplars by selection, hybridization, and induced polyploidy.

3641. HYUN, S. K. **Report on the selection of stands and single trees for seed production and breeding by means of general inventory—original species and exotics.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956*, No. *IUFRO*/56/22/2, 1956. pp. 2.

Notes on measures being taken in Korea to select élite stands of the indigenous *Pinus densiflora*, and to breed improved strains of the introduced *P. rigida*, which has been extensively planted. The possibility of producing hybrids of the two species is mentioned.

3642. SCHRÖCK, O. Die Ermittlung des individuellen Wachstumganges von Einzelbäumen für Samenproduktion und Züchtung. **[The determination of the course of growth of individual trees for seed production and selection.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/22/16, 1956. pp. 3. 11 refs. [G.]

Summarizes the author's work on the determination of the inherent growth capacity of Scots Pine seedlings. [Cf. *For. Abstr.* 16 (No. 1420).]

3643. ACHTERBERG, H. H. Bedeutung der fototropischen Kiefernkeimlingsdiagnose für die Anerkennung der Bestände. **[The phototropic testing of Pine embryos as a guide for the certification of stands [for seed].]** *Wald* 3 (9), 1953 (269–70). 16 refs. [G.]

A description of the method, and a discussion of its limitations, stressing the need for other criteria of seed evaluation, particularly stand history. [Cf. *For. Abstr.* 1 (p. 82, Götz).]

3644. **Results of hybridization and other controlled breeding.** *Rep. Sth. For. Exp. Sta. 1955* [1956] (7–10).

Seedlings were raised from a number of controlled crosses made in 1953, including *Pinus palustris* × *P. elliottii* and Sonderegger Pine (*P. palustris* × *P. taeda*). Several thousand seeds from 30 controlled interspecific and special intraspecific crosses were harvested. Shortleaf × Slash Pine crosses, and crosses made with these as ♂ and Sonderegger Pine as ♀ parent are of particular interest.

3645. **[Studies on Pine hybrids.]** *Rep. Calif. For. Range Exp. Sta. 1955* [1956] (25–8).

A hybrid, Apache Pine [*P. engelmannii*] × Arizona Pine [*P. ponderosa* var. *arizonica*] has needles longer and coarser than those of Arizona Pine, but shorter and finer than those of Apache Pine, is intermediate between the parents in diameter-growth rate, produces 4–5 needles per bundle like Arizona Pine, and forms bark scales early like Apache Pine. This last character may be important in practice as giving young trees some protection against fire and attack by the Pine reproduction weevil. The 3-way hybrid already examined [see *For. Abstr.* 16 (No. 3808)] continued to exceed Ponderosa Pine in height. Another 3-way hybrid (Jeffrey Pine × Jeffrey Pine × Coulter Pine) × Ponderosa Pine gave similar results.

3646. SCHEPLITZ, B. Über einen natürlichen *Abies*-Bastard. Morphologische und holztechnologische Untersuchung an Artbastarden von *Abies concolor* × *Abies grandis*. **[A natural *Abies* hybrid. Investigations into the morphology and wood technology of a species hybrid of *A. concolor* × *A. grandis*.]** *Z. Forstgenet.* 5 (3), 1956 (71–9). 32 refs. [G.g.e.f.]

Naturally occurring hybrids at the Berlin-Dahlem Arboretum were found to have resulted from the pollination of *A. concolor* by *A. grandis*. In the hybrids, morphological characters of both parents segregated independently of one another. Growth is remarkably good, and the trees appear to have good resistance to low temperature and drought. Characteristics of the wood closely resemble those of *A. grandis*. The characteristics of *A. grandis* and *A. concolor* are discussed and it is suggested that their relationship is closer than that between species. *From author's summary.*

3647. TESDORFF, H. Kreuzungsversuche mit *Araucaria araucana* (Molina) K. Koch und *Araucaria angustifolia* (Bertoloni) O. Ktze. **[Trials in crossing *A. araucana* with *A. angustifolia*.]** *Z. Forstgenet.* 5 (3), 1956 (79–84). [G.g.e.f.]

Experiments were undertaken in cross-pollination in (1) the southern Cordilleras (cold climate), where one 40-year-old and one 120-year-old ♀ *A. araucana* were pollinated with pollen from ♂ *A. angustifolia* in Misiones, and (2) in Misiones (subtropical climate), where an 18-year-old ♀ *A. angustifolia* was pollinated with pollen from ♂ *A. araucana* in the southern Cordilleras. The pollen retained its viability after low-temperature storage in the laboratory. From (1) 68 seedlings were raised, 15 of which were planted out in the southern Cordilleras, and 53 in Central Argentina. From (2), only 3 healthy seedlings were raised. In both crosses, characters of the mother trees were dominant. *From author's summary.*

3648. NAKAMURA, K. Vererbung von Eigenschaften der Mutterbäume. Über den Einfluss des Alters der Mutterbäume auf die Nachkommenschaften. **[The inheritance of characteristics of the mother tree. The influence of the age of the mother tree upon the progeny.]** *Z. Forstgenet.* 5 (3), 1956 (85–6). [G.]

In breeding experiments in Japan, it has been observed that certain individuals of *Cryptomeria japonica* begin to flower very young and bear abundant seed. Such individuals are usually retarded in growth compared with other trees of the same age. Observations over a period of 20 years on progeny from mother trees ranging in age from 13 to 600 years confirmed the superior growth characteristics of the progeny of the older trees.

3649. GATHY, P. E. J. M. Observations sur la disjonction des caractères de *Larix eurolepis* à la F_2. **[The disjunction of characters in F_2 generations of hybrid Larch, × *L. eurolepis*.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/22/11, 1956. pp. 6. 6 refs. [F.]

Study of Larch hybrids has been in progress at Groenendaal since 1948, and the data so far obtained are analysed and discussed. There are no clearly defined classes of hybrids, but a continuous variation of characters from typical Japanese, to typical European Larch, with no evidence for a Mendelian segregation in the F_2. Intermediate forms, however, appear to display heterosis.

3650. SANTAMOUR, F. S., JR., and NIENSTADT, H. **The extraction, storage and germination of Eastern Hemlock pollen.** *J. For.* 54 (4), 1956 (269–70). 1 ref.

Tsuga canadensis sheds its pollen in early May. The forcing time of branches cut in early February can be reduced 8 days by subjecting them to a 20-hour day, but this difference decreases gradually and ceases a few days before the time of natural shedding. Righter's 10% sucrose technique is very satisfactory for viability tests. Pollen can be stored at 1–16° C., but relative humidity should be 50 rather than 10%.

3651. RUBNER, K. Zum Baumrassenproblem in Mitteleuropa. **[On the problem of tree races in Central Europe.]** *Schweiz. Z. Forstw.* 107 (4), 1956 (217–25). 18 refs. [G.g.f.]

Deals chiefly with the racial peculiarities, such as straight stems, narrow crowns, better height growth and shade tolerance, longevity etc., of Eastern European (east of the Vistula) local races of Pine, Birch, Alder, Aspen, and (partly) Hornbeam. Most of these races, which are considered to be relicts, retain their favourable characteristics when grown further west, and they are recommended for mixtures. Similar relict races occurring in Central Europe (e.g. the high-level Pines of the mountains of Central Germany; a race of Common Alder on the Swiss-French border, and the Wienerwald Larch) and other local races, particularly of Pine, the connexion between growth characters and site, and resistance to *Lophodermium pinastri* in Pine, are also discussed.

3652. SCHRÖCK, O., and SCHOLZ, E. Einiges über Furnierbirken, insbesondere Flammbirken und deren Erkennen im Bestande. **[Veneer Birches, particularly wavy-grained Birches, and how to recognize them in the stand.]** *Wald* 3 (6), 1953 (180–3). [G.]

A preliminary report, with illustrations of an investigation undertaken at the Institute for Tree-breeding, Waldsieversdorf, of the Faculty of Forestry, Eberswalde, into the connexion between various types of rough bark and wavy grain in German Birches.

3653. JOHNSSON, H. **Auto- and allotriploid *Betula*-families, derived from colchicine treatment.** *Z. Forstgenet.* 5 (3), 1956 (65–70). 6 refs. [E.e.g.f.]

By means of colchicine treatments, tetraploid individuals were produced in *Betula verrucosa* and in *B. japonica* × *B. verrucosa*. These artificial tetraploids are characterized by large, coarsely dentate leaves, large fruits and bracts, but they are slow-growing and often have an abnormal form, owing to excessive branchiness. Pollen grains are larger than in the original diploids. Fertility on the ♀ side is reduced, but remains high enough to obtain large progenies. The C-tetraploid *B. verrucosa* and the C-amphidiploid *B. japonica* × *B. verrucosa* were pollinated with diploid *B. verrucosa* and triploid progenies were obtained. In the allotriploid progeny, however, individuals with deviating higher chromosome numbers occur in a rather high frequency, indicating that meiosis in the amphidiploid is irregular. The triploid progenies grow normally without the retardation shown by the C-tetraploid mothers. During the first summer the height growth of the triploids has been somewhat less than that of comparable diploid families, but diameter growth has equalled theirs. The autotriploid progeny has developed unusually few 'proleptic' branches. The triploids show greater variability than the diploids, owing to the fact that extremely small plants occur in excess in the triploid families. It seems safe to predict that the triploids will continue to grow normally and that they will probably grow somewhat less in height and more in diameter than the original diploid strains. *From author's summary*.

3654. SCHMIDT, H. Zur genetischen Beurteilung der Buche in der bayerischen Alpen und im Bayerischen Wald. **[The genetics of Beech in the Bavarian Alps and in the 'Bayerischer Wald'.]** *Forstwiss. Cbl.* 74 (5/6), 1955 (154–63). 18 refs. [G.]

Discusses the 'strains' recognized by Krahl-Urban [cf. *For. Abstr.* 16 (No. 2688)], and suggests that not enough account has been taken of site and biotic factors affecting form in Beech.

3655. LEIBUNDGUT, H. Beitrag zur Rassenfrage bei der Esche. **[*Fraxinus excelsior* and its races.]** *Schweiz. Z. Forstw.* 107 (3), 1956 (165–74). 5 refs. [G.f.]

Seedlings derived from 3 mother trees, one a typical 'lime Ash' from a dry, shallow, calcareous site, and 2 typical 'water Ashes' from moist sites (one marly, one alluvial) were grown in pots filled with 5 different soils. Examination after 3 years revealed no significant differences as to time of flushing, height growth, root development or ash content between the 3 provenances, but marked differences between seedlings grown in different soils, e.g. retarded flushing on alkaline soils and better height growth on brown forest soil.

3656. WETTSTEIN, W. Kurze Information über die Zitterpappel ('Aspe'). **[A note on *Populus tremula*.]** *Allg. Forstztg.* 65 (21/22), 1954 (263–4). [G.]

A general description of distribution, site requirements, growth characteristics and uses, with an account of earlier (1936–39) experiments in crossing trees from widely distant habitats, followed by a table, with explanations, giving 1st-year growth results for 26 inter- and intraspecific crossings of *P. tremula*, *P. alba*, *P. grandidentata* and *P. tremuloides*. All hybrids showed better growth than *P. alba*, and local combinations were better than combinations with American species. The use of hothouse-ripened seeds lengthened the vegetative period and resulted in bigger 1-year seedlings.

168. Histology

See also Nos. 3883, 3891, 4388 *et seq.*, 4418.

3657. REINERT, J., and WHITE, P. R. **The cultivation *in vitro* of tumor tissues and normal tissues of *Picea glauca*.** *Physiol. Plant., Copenhagen* 9 (2), 1956 (177–89). 36 refs. [R. B. Jackson Memorial Laboratory, Bar Harbor, Me.]

Tissues of *P. glauca* from the cambial region of the massive epiphytotic tumours characteristic of this species [cf. *For. Abstr.* 17 (No. 4260)] and from trees not bearing tumours, were cultivated *in vitro*. Tumour tissues, when they grew at all, always began growing more promptly than normal tissues, but many failed to grow and all were more erratic in growth than normal tissues, and appeared to require vitamin B_{12}, which is not required by normal tissues. The presence of tumours did not affect the behaviour of normal tissue from tumour-bearing trees.

3658. SAX, K., and DICKSON, Q. **Phloem polarity in bark regeneration.** *J. Arnold Arbor.* 37 (2), 1956 (173–9). 8 refs.

By inverting a ring of bark from an Apple tree with red wood on to a tree with white, it was shown that the bark regenerated on the vertical seam was derived from the underlying wood and not from the adjacent bark. Phloem transport to the roots was checked and the tree dwarfed, but not permanently, even with a double bark inversion with the vertical seams on opposite sides, because lateral diffusion soon bridged the gap between the normal and the polarized tissues.

17. Systematic Botany

172.8. Eumycetes (True Fungi)

See also Nos. 4087 *et seq.*, 4508 *et seq.*

3659. BAXTER, D. V. **Some resupinate polypores from the region of the Great Lakes. XXVI.** *Pap. Mich. Acad. Sci.* 40, 1954 (1955), (91–108 + 6 plates). 8 refs. L.S.

Lists the polypores in eastern and northern plant associations in which the following species are dominant: (1) *Populus* spp. (chiefly *P. tacamahaca*), (2) *Populus* spp. (chiefly *P. deltoides*), (3) *Picea mariana*, (4) *Pinus banksiana*, (5) *Pinus resinosa*, (6) *Liriodendron tulipifera* and *L. tulipifera*/*Quercus alba*, (7) *Quercus montana*, (8) *Quercus stellata*/*Q. marilandica*, (9) *Juniperus virginiana*, (10) *Betula nigra*/*Platanus occidentalis*, (11) *Chamaecyparis thyoides*, (12) *Taxodium distichum*/*Nyssa aquatica*/*Liquidambar styraciflua*, (13) *Pinus serotina*, (14) *Quercus nigra*/*Liquidambar styraciflua*, and (15) *Quercus virginiana*/*Sabal palmetto*. An account is also included of *Poria vaillantii*, a species found in North

America mainly on greenhouse benches. [Cf. *For. Abstr.* 16 (No. 1449).]

174. Spermatophyta, Seed-Plants in General. Floras and Check-Lists

3660. Gaussen, H. Les 'nomina conservanda' pour les arbres forestiers. **[*Nomina conservanda* for forest tree species.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/22/7, 1956. pp. 6. [F.]

Discusses the principles involved, and lists the species (indigenous and exotic) commonly used for planting in Europe, proposing, where necessary, the retention of the generally used scientific name even where it runs counter to the law of priority.

3661. Little, E. L., Jr. **Rejection of obscure, ineffectively published plant names.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/22/13, 1956. pp 4.

The following new article is proposed as an amendment to the International Code of Botanical Nomenclature (1952): 'A name of a taxon is not effectively published if it neither has been accepted by a second author nor has been cited in an index of scientific names within 50 years of publication or by January 1, 1960, if published before 1910'.

3662. Kiellander, C. L. **Some aspects of the English names of *Picea abies* (L.) Karst. and *Pinus sylvestris* L.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/22/14, 1956. pp. 2.

European Spruce, European Pine, and Black Pine are proposed as English names for *Picea abies*, *Pinus sylvestris*, and *P. nigra*.

3663. Métro, A., and Sauvage, C. Flore des végétaux ligneux de la Mamora. **[Flora of woody plants of the Mamora [Cork Oak forest, Morocco].]** Société des Sciences Naturelles et Physiques du Maroc, Rabat. 1955. pp. 497 + 1 map + 40 plates. 29 refs. [F.] (*La Nature au Maroc* Vol. 1.)

Discuses briefly location, soils, climate, vegetation types, forest management, and reforestation, and gives keys to the plants and descriptions with drawings of some 200 species, covering the plant, its distribution, biology and uses.

3664. Berhaut, J. Flore du Sénégal. Brousse et jardins. (Savanes de l'Afrique occidentale.) Clé pratique. **[A practical key to the savanna and garden flora of Senegal.]** Librairie Clairafrique, Dakar. 1954. pp. x + 300 + 21 plates in colour. 2 refs. [F.]

This popular key, based mainly on vegetative characters, includes about 1800 species, of which the indigenous ones are the 1500 known plants of an expected total of 2000. An index to the species is included.

3665. Exell, A. W. **Supplement to the catalogue of the vascular plants of S. Tomé (with Principe and Annobon).** British Museum, London. 1956. pp. 58. Price 12*s*. 6*d*. [Cf. *For. Abstr.* 6 (p. 150).] Describes the following new species: *Rothmannia arcuata* and *Ficus fernandesiana*.

3666. Turrill, W. B., and Milner-Redhead, E. [Editors]. **Flora of tropical East Africa: Connaraceae.** Crown Agent for the Colonies, London. 1956. pp. 27. Price 3*s*.

174.2/.7. Gymnosperms

See also No. 3696.

3667. Klášterský, I. Šišky s deflexními šupinami na smrku (*Picea excelsa* Link.) **[Cones with reflexed scales in *P. abies*.]** *Preslia* 27 (4), 1955 (417–23). 17 refs. [Cz.] A.P.B.

Describes and illustrates such cone forms found by the author and others in Czechoslovakia, and briefly reviews relevant literature. In contrast to Tyszkiewicz, who described a f. *deflexa* on this basis, the author concludes that such cones are probably abnormalities arising from a combination of physiological state of the tree and the action of external factors, of which the chief may be frost at some critical stage of development.

3668. Mirov, N. T. **Relationships between *Pinus halepensis* and other *insignes* Pines of the Mediterranean region.** *Bull. Res. Coun. Israel.* 5*D* (1), 1955 (65–72). 22 refs. [Institute of Forest Genetics, California Forest and Range Experiment Station, Berkeley.]

Differences have been established between (*a*) *Pinus halepensis s.s.* and (*b*) *P. brutia* in morphology and ecology, in the resistance of (*b*) to *Matsucoccus*, and in its better timber quality. Further support for these distinctions is given by an analysis of their turpentines. That of (*a*), which is dextrorotatory, may be characterized by the absence of β-pinene and d-Δ^3-carene, while that of (*b*), which is laevorotatory, has both. *P. pithyusa* closely related to (*b*) has large amounts of the second terpene. A map shows the distribution of these closely related Mediterranean *Insignes* Pines—*P. halepensis*, *P. brutia*, *P. pithyusa*, *P. stankewiczii* and *P. eldarica*.

3669. Gray, N. E. **A taxonomic revision of *Podocarpus*, X. The South Pacific species of section *Eupodocarpus*, Subsection D.** *J. Arnold Arbor.* 37 (2), 1956 (160–72). 18 refs.

The species and varieties included in this subsection are *P. totara*, *P. halii*, both of New Zealand, *P. nubigenus*, from southern Chile, *P. nivalis* and its var. *erectus*, *P. acutifolius*, *P. alpinus*, and *P. gnidioides*. Only the first 3 are of timber interest. All except the third are keyed and described. [Cf. *For. Abstr.* 17 (No. 166).]

175.2. Monocotyledons

See also No. 3698.

3670. McClure, F. A. **New species in the Bamboo genus *Phyllostachys* and some nomenclatural notes.** *J. Arnold Arbor.* 37 (2), 1956 (180–96). 1 ref.

Publishes Latin descriptions of 4 Chinese species (7–10 m. in height), introduced at the Barbour

Lathrop Plant Introduction Garden, Georgia, with a discussion of nomenclature and descriptive notes on cultivars.

3671. MOZINGO, H. N. **A vegetative key to the native and commonly cultivated Palms in Florida.** *Quarterly Journal of the Florida Academy of Sciences, Gainesville* 17 (1), 1954 (46–54). 17 refs. L.S.
Lists 80 species.

176.1. Dicotyledons

See also Nos. 3633, 3636, 3692–3, 4389.

3672. WILBUR, R. L. **A synopsis of *Jatropha* subsection *Eucurcas*, with the description of two new species from Mexico.** *J. Elisha Mitchell sci. Soc.* 70 (1), 1954 (92–101). 5 refs. L.S.
The 2 new species described are *Jatropha hintonii* and *J. bartlettii.*

3673. INAL, S. Meşe (*Quercus*)—Hakkında etimolojik ve tarihî etüdler. **[Etymological and historical studies on Oak (*Quercus*).]** *Istanbul Üniv. Orm. Fak. Derg. 5B* (1), 1955 (100–11). 15 refs. [Turk.]

3674. ALVAREZ LOPEZ, E. Comentario sobre '*Laurus*' de Ruiz y Pavón, connotas de Dombey acerca de algunas de sus especies. **[Comments on the '*Laurus*' of Ruiz and Pavón, with notes by Dombey on some of the species.]** *An. Inst. bot. A. J. Cavanilles* No. 13, 1954 (1955), (71–8). [Span.] O.B.D.
Presents notes on an extract from the *Flora Peruviana et Chilensis*, by H. Ruiz and J. Pavón, the text of which has hitherto remained unpublished. The section in question, dealing with the genus *Laurus*, is published on pp. 5–70 of this issue, and includes plates, already published in Pavón's *Laurographia.*

3675. EXELL, A. W., and MENDONÇA, F. A. Novidades da flora de Angola. **[New taxa in the flora of Angola.]** *Bol. Soc. broteriana* (*Ser. 2*) Vol. 29, 1955 (29–44 + 7 plates). [Port.E.]
Two new tree species are described: *Berlinia lundensis* and *Albizzia mossamedensis.*

3676. HOYLE, A. C. **A new genus of Leguminosae (Caesalpinioideae) from Gabon and Cabinda.** *Bol. Soc. broteriana* (*Ser. 2*) Vol. 29, 1955 (17–21 + 3 plates). [E.]
A new genus *Librevillea* is erected, differing from *Brachystegia*, from which it is removed, in the venation of the tepals, in the pod without winged adaxial suture and in the alternate, petiolulate leaflets with symmetrical nervation at the base. An emended and amplified description is presented of the type species *Librevillea klainei.*

3677. CODD, L. E. **The *Schotia* species of southern Africa.** *Bothalia* 6 (3), 1956 (515–33).
A taxonomic review, with descriptions and key, reducing the number of species recognized in the region to 4, viz. *S. afra* (2 vars.), *S. capitata*, *S. latifolia* and *S. brachypetala*. Two groups of forms intermediate between *S. afra* and *S. latifolia* are treated tentatively as hybrids.

3678. CODD, L. E. **Notes on certain South African *Erythrina* species.** *Bothalia* 6 (3), 1956 (507–14).
Discussion of the distinctions between *E. lysistemon* and *E. caffra*, and between *E. latissima* and *E. abyssinica*, with tabular comparisons of characters.

3679. CHOCK, A. K. **A taxonomic revision of the Hawaiian species of the genus *Sophora* Linnaeus (family Leguminosae).** *Pacif. Sci.* 10 (2), 1956 (136–58). 27 refs. E.M.B.

3680. FERNANDES, A., and DINIZ, M. A. Contribuição para o conhecimento das Lythraceae da Guiné Portuguesa. **[The Lythraceae of Portuguese Guinea.]** *Repr.* from *Garcia de Orta, Lisboa* 3 (2), 1955 (193–8). [Port.f.]
Descriptions resulting from a study of specimens in Portuguese herbaria, with a key.

3681. HARDIN, J. W. **An analysis of variation within *Magnolia acuminata* L.** *J. Elisha Mitchell sci. Soc.* 70 (2), 1954 (298–312). 17 refs. L.S.

3682. BUCHINGER, M., and FALCONE, R. Nota sobre algunas Meliáceas argentinas. **[Notes on some Argentine Meliaceae.]** *Boletín de la Sociedad Argentina de Botánica, Buenos Aires* 5 (4), 1955 (203–8). [Span.] L.S.
Notes on some points requiring elucidation that arose in the preparation of a large-scale work on this subject. Species dealt with are *Guarea* spp. and *Trichilia* spp.

3683. BLAKELY, W. F. **A key to the Eucalypts with descriptions of 522 species and varieties.** Forestry and Timber Bureau, Canberra. 2nd ed., 1955. pp. 359. Price £1.0*s*. 0*d*.
A revised and enlarged edition of the work first published in 1934.

3684. CAVACO, A., and KERAUDREN, M. Sur le *Turraea thouarsiana* (Baill.) Cavaco et Keraudren, comb. nov. et une espèce nouvelle d'*Olax*. **[*T. thouarsiana* and a new species of *Olax*.]** *Bol. Soc. broteriana* (*Ser. 2*) Vol. 29, 1955 (23–5 + 2 plates). [F.]
Describes *O. tsaratananensis*, a tree 8–12 m. high found in the region of Tsaratanana, Madagascar, at 1500 m. alt.

3685. VERDOORN, I. C. **The Oleaceae of southern Africa.** *Bothalia* 6 (3), 1956 (549–639).
A taxonomic revision, with keys. Some reductions to subspecific rank are made in *Olea* and *Linociera.*

3686. ROL, R. Note sur les peupliers du Cachemire. **[Notes on the Poplars of Kashmir.]** [*Pap.*] *8th Sess. int. Poplar Comm., Madrid, 1955* No. *FAO/CIP/79-G.* 1955. pp. 3. [F.] Limited distribution.
Tentatively identifies the following: *Populus ciliata, P. longifolia, P. suaveolens, P. thevestina* and *P. triloba.* Large specimens of *P. triloba* are found growing naturally at 2500 m. alt. at the lower limit of the Himalaya Cedar forest. All others are mostly young, their form spoilt by frequent lopping.

3687. Clonaru, A., and Ocskay, S. Un nou plop piramidal in flora R.P.R.: *Populus nigra* L. var. *thevestina* (Dode, Bean). **[A new fastigiate Poplar in the flora of Rumania: *P. nigra* var. *thevestina*.]** *Bul. şti. Acad. Repub. rom.* (*Sect. Biol.*) 7 (4), 1955 (981–97). 11 refs. [Rum.russ.f.] O.R.S.

This Poplar has recently been identified in the South of Rumania, where it is common on poor, sandy soils. All trees appear to be ♀. Its value as a source of pulpwood is discussed.

3688. Zohary, M. **The genus *Tamarix* in Israel.** *Trop. Woods* No. 104, 1956 (24–60). 23 refs.

This critical revision (with key) raises the number of species recognised from 5 to 16. Included in the descriptions are one exotic, 4 new species and a number of new varieties. Thousands of acres of wadi beds in the Dead Sea region could probably be successfully afforested with them, were better knowledge of their ecology and uses available. Some are used for street planting. [Cf. *For. Abstr.* 16 (No. 3842).]

3689. Kobuski, C. E. **Studies in the Theaceae, XXVIII. *Melchiora,* a new genus in Africa.** *J. Arnold Arbor.* 37 (2), 1956 (153–9). 1 ref.

The African species of *Adinandra* are transferred to a new genus, *Melchiora*, which is described, and the new combinations, *M. mannii*, *M. schliebenii* and *M. intermedia* are made. These species are keyed and described. [Cf. *For. Abstr.* 14 (No. 3129).]

18. Plant Ecology

See also Nos. 3564–70.

181. Mode of Life, Autecology. Silvicultural Characters of Trees

3690. Myczkowski, S. Z zagadnień ekologii buka zwyczajnego. **[Problems of ecology of *Fagus sylvatica*.]** *Sylwan* 99 (4), 1955 (318–32). 29 refs. [Pol.pol.]

In S.E. Poland, Beech in the *Fagetum carpaticum* occurs in the lowlands in the community *Fagetum subhercynicum* (= *Fagetum boreoatlanticum*), while the Beech communities in the Sudeten belong to a transitional type. The effect of site factors (soil, frost, drought, wind, snow, light) and phenological phenomena, lammas shoots, the mutual influence of trees and their inherited properties, are discussed, citing Polish, German and Scandinavian literature. In dense Beech stands, felling should aim at a 75% opening of the canopy. Young stands growing under old stands should be gradually released and Silver Fir, Larch and Spruce introduced into stands belonging to *Fagetum carpaticum* (to increase frost resistance). No dense pure Beech stands should be introduced or maintained on the upper mountain slopes.

3691. Ritchie, J. C. **Biological flora of the British Isles: *Vaccinium myrtillus* L.** *J. Ecol.* 44 (1), 1956 (291–9). 33 refs.

Discusses geographical and altitudinal distribution, habitat, communities, response to biotic factors, morphology, phenology, floral biology, animal feeders or parasites, and plant parasites.

3692. Kan, W. H., and Chang, L. M. **[Morphology and characteristics of various species of *Casuarina* in Formosa.]** [*Report*] *Forest Experiment Station, Botanical Garden, Taipeh, Formosa* No. 1, 1954. pp. 7 + 1 tbl. [Chin.]

Thirteen species are named and compared morphologically and phenologically in a table, with notes on temperature and moisture requirements of the 9 most important. *C. equisetifolia* is considered the best species, particularly for its ready regeneration from seed.

3693. Essências florestais da Guiné Portuguesa. 1. *Khaya senegalensis* A. Juss. (Bissilão). **[Forest species of Portuguese Guinea. 1. *K. senegalensis*.]** Jardim e Museu Agrícola do Ultramar, Ministério do Ultramar, Lisboa. 1955. pp. 14 + 6 plates. [Port.e.f.]

Characteristics of the genus, description of the species, habitat, ecology, range, anatomy and properties of the wood, and medicinal uses.

3694. Jozami, J. M. El álamo 'Arnaldo Mussolini" en la Argentina. **[*Populus* 'A.M.' in Argentina.]** Dirección de Agricultura y Colonización, Ministerio de Obras Publicas, Comercio e Industria, Gobierno de Entre Rios, Paraná. [1954?]. pp. 16. 32 refs. [Span.]

Notes on the Poplar, its nomenclature, silvicultural characters, cultivation, growth in Argentina, diseases in Argentina, and properties and uses of the wood.

181.1. Distribution, Natural Range

3695. Løfting, E. C. L. Ædelgranforekomsten i Normandiet. **[The distribution of *Abies alba* in Normandy.]** *Dansk Skovforen. Tidsskr.* 40 (6), 1955 (286–98). [Dan.]

Discusses its geographical distribution and the prevailing climatic conditions as compared with those of other provenances (e.g. the Polish-Rumanian border) and gives brief particulars of a visit to the region in 1954.

3696. Kayacik, H. Türkiye camları ve bunların coğrafî yayılışları üzerinde araştirmalar. **[Pines in Turkey and their distribution.]** *Istanbul Üniv. Orm. Fak. Derg.* 4*A* (1/2), 1954 (44–64). 27 refs. [Turk.e.]

Pines (*P. sylvestris*, *P. nigra* var. *pallasiana*, *P. halepensis*, *P. h.* var. *brutia*, and *P. pinea*) cover 38·5% of the 10·9 million ha. of the Turkish forests. A map shows the occurrence of Scots Pine in large areas E.S.E. of Ankara, hitherto unnoticed in the literature. Another map shows the occurrence of the Aleppo Pine in the area on the skirts of the Taurus mountains S.E. of Ankara. This Pine is definitely indigenous but its range is more restricted than the literature would imply. Many photographs of the open types of forest are given and the distinguishing characters of *P. halepensis* and *P.h.* var. *brutia* are illustrated.

3697. Goder, H. A. **A phytosociological study of *Tsuga canadensis* at the termination of its range in Wisconsin.** *Abstr. of thesis* in *Dissert. Abstr.* 16 (3), 1956 (438). [University of Wisconsin.] O.R.S.

The dominant species in the 34 stands sampled were *T. canadensis*, *Acer saccharum* and *Betula lutea*. Germination and successful establishment generally occur on mounds originating from fallen trunks, decayed stumps or disturbed soil. It was present in 32 stands. In S. Wisconsin, climatic factors limit the species to areas of cool temperatures and high moisture conditions. [Cf. *For. Abstr.* 17 (No. 1312).]

3698. RAIZADA, M. B., and CHATTERJI, R. N. **World distribution of Bamboos with special reference to the Indian species and their more important uses.** *Indian For.* 82 (5), 1956 (215–8).

3699. FENTON, E. W. **An outline of Oak distribution in Scotland and the need for local records.** *Scot. For.* 10 (2), 1956 (104–7). 8 refs.

3700. AUBRÉVILLE, A. Colloque sur les groupes à aires de répartition disjointes (3e partie): la disjonction africaine dans la flore forestière tropicale. **[On groups with discontinuous distribution areas. (3rd part): The African break in the forest flora of the tropics.]** *Compte Rendu Sommaire des Séances de la Société de Biogéographie, Paris* 32 (278/280), 1955 (42–9). [F.] L.S.

A discussion of the palaeoclimatic and archaeological conclusions to be drawn from the fact that many great floristic groups characteristic of the subtropical and tropical transition zones (e.g. the Lauraceae, the Magnoliaceae and the Myrtaceae) are represented by numerous genera and species in America, Asia and Oceania (including Australia) but few or none in Africa, particularly West Africa.

3701. LITCHFIELD, W. H. **Species distribution over part of the Coonalpyn Downs, South Australia.** *Aust. J. Bot.* 4 (1), 1956 (68–115 + 1 map). 29 refs. O.B.D.

An account is given of edaphoclimatic ranges and species area of elements of the mainly sclerophyllous vegetation of a representative portion of the Coonalpyn Downs. *Eucalyptus*, *Melaleuca*, *Acacia*, *Hakea*, *Leptospermum*, *Casuarina* and *Callitris* are the principal genera discussed. *From author's summary.*

181.2. Atmospheric Relations. Acclimatization

See also Nos. 3728–9, 3755, 3996.

3702. BAŁUT, S., and ŻELAWSKI, W. Przebieg rocznego cyklu życiowego siewek sosny pospolitej i świerka pospolitego przy nieprzerwanym oświetleniu. **[The annual growth cycle of *Pinus sylvestris* and *Picea abies* seedlings under continuous illumination.]** *Sylwan* 99 (6), 1955 (501–4). [Pol.russ.e.]

Recently germinated seedlings (12 Pine and 6 Spruce) were exposed to a continuous illumination of 1000 luxes from June until November. All other conditions being held constant, this illumination prevented the seedlings from completing the normal annual growth cycle. Pine seedlings did not form the apical bud at the usual time; when it did form, much later, no further height increment ensued and growth was below normal. Spruce seedlings, however, showed 3 increment periods, but total growth was about normal.

181.3. Water, Soil and Root Relations (including Bacterial and Mycorrhizal Symbiosis)

See also Nos. 3571, 3578–87, 3591, 3626, 3655, 3729, 3741, 3755, 3759, 3800, 3862, 3930, 3996, 4047, 4052, 4056, 4087, 4264, 4301–2, 4651.

3703. MCVEAN, D. N. **Ecology of *Alnus glutinosa* (L.) Gaertn. III. Seedling establishment.** *J. Ecol.* 44 (1), 1956 (195–218). 21 refs.

[Cf. *For. Abstr.* 16 (No. 2773).] Experiments on the relations of seedlings to soil moisture are described, *Betula pubescens* being used for comparison: (1) Seedling establishment in waterlogged soil. (2) Effect of waterlogging at various developmental stages. (3) Establishment at various heights above a constant water-table. (4) Effect of periodic drying of the soil. It is concluded that in regions of low rainfall (50–65 cm.) Alder seedlings will only establish themselves where the surface soil falls within the capillary fringe of the water-table, so that it remains constantly moist for 20–30 days in spring (March–May). Heavier rainfall and a cover of vegetation modify this picture. The Alder seedling is better adapted to establishment in very wet and waterlogged soils than is the Birch, and pure stands of Alder can be obtained from mixed sowings by appropriate treatment. It is also more resistant to complete inundation at all stages of development. A water-table at a depth of 10–30 cm. is optimal for early Alder establishment, but subsequent growth is best on drier sites. The Birch seedling is better adapted to establishment in habitats subject to periodic drying out, and pure stands of Birch can thus be obtained from mixed sowings, though not so easily as pure Alder stands can be obtained by flooding. The different buoyancies of the seed, the different susceptibilities of the radicles to drying out, and the different ratios of shoot to root development are all concerned in this.

The growth of seedlings on different soils is described, and establishment found to be satisfactory on all except acid peats and highly calcareous soils. Pure fen peat appears to lack some factor, present in mineral soil, necessary for the optimum development of the seedlings. An experiment on the addition of various fertilizers to the peat indicated that the phosphate radical is largely concerned. Development of nodules and mycorrhiza is found to have little effect on establishment except perhaps on the most infertile sands. Field and pot experiments on light intensity and root competition are described. It is concluded that low light intensity, supplemented by insect attack, flooding etc. is a frequent cause of regeneration failure in woods and thick herbaceous vegetation. Root competition appears to be of greatest importance in the drier grass turfs. The significance of these factors in natural population structures and succession is briefly discussed. *From author's summary.*

3704. MCVEAN, D. N. **Ecology of *Alnus glutinosa* (L.) Gaertn. IV. Root system.** *J. Ecol.* 44 (1), 1956 (219–25). 12 refs.

Analysis of the gas contained in Alder roots from below the soil water-table is described and the results shown to be comparable with those obtained by other workers on the submerged parts of herbaceous aquatics. The gas is largely contained in the xylem elements as in the genus *Aeschynomene*. The structure of the water lenticels on stems, roots and nodules is described and the suggestion made that they may play an important part in the root aeration mechanism of the species when growing on waterlogged sites. Root-cutting experiments to test the importance of different parts of the root system in the water supply of the tree have shown that the deep tap roots may well account for the success of established Alder on sites of deep water-table. The importance of the surface system (with its nodules and mycorrhiza) in the nutrition of the tree on infertile soils was also demonstrated by this method. *Author's summary*.

3705. SEVIM, M. Muhtelif toprak türlerinde karaçam ve sarıçam intaş fideciklerinin pörsüme noktaları üzerinde denemeler. **[The relation between the wilting of Pine seedlings and the moisture of the soil.]** *Istanbul Üniv. Orm. Fak. Derg.* 4*A* (1/2), 1954 (65–73). 5 refs. [Turk.g.]

Seedlings of *P. sylvestris* and *P. nigra* [? var. *pallasiana*] (from two dry-climate Turkish provenances), grown in coarse sand, loam, and light clay (mechanical analysis given), for which the field capacity was respectively 22·2, 54·5 and 80%, wilted when this had been reduced (Scots Pine) to 0·55, 6·2, and 12·9 and (*P. nigra*) 0·75, 8·1, and 14·7 respectively. Wilting begins at a higher moisture content as the clay fraction of the soil increases.

3706. KARSCHON, R. La croissance d'*Eucalyptus camaldulensis* Dehn. sur sols calcaires salins. **[The growth of *E. rostrata* on calcareous saline soils.]** [*Docum.*] *2nd Sess. Working Party on Eucalypts, FAO Jt. Subcomm. Medit. For. Probl., Nice 1956* No. *FAO/SCM/EU/7-A*, 1956. pp. 5. 8 refs. [F.]

In a previous publication [cf. *For. Abstr.* 15 (No. 2602)] the author concluded that chlorosis of *E. rostrata* on calcareous soils was due to lack of Fe. Further observations, reported in detail, have now shown that this species can survive without injury on soils with a high content of active CaO provided that they also contain appreciable quantities of organic matter and soluble salts. In such conditions it will tolerate a Cl content of 0·51% and a total salinity (chlorides and sulphates) of 1·25%.

3707. BHATIA, K. K. **Factors in the distribution of Teak in Madhya Pradesh**. *J. Indian bot. Soc.* 34 (4), 1955 (459–90). 21 refs. O.B.D.

Climate, surface geology and vegetation in a number of Teak stands are described. The soils were studied for pH, moisture content, exchangeable Ca, Mg, K, total available phosphates, N, organic matter and C/N. A positive correlation was established between the growth and distribution of Teak and soil pH, exchangeable Ca, Mg and phosphates. No significant correlation could be found for N, organic matter and C/N. Teak usually avoids both excessively dry and waterlogged situations. On acid soils with low phosphate and low base content, regeneration suffers set-backs. *From author's summary*.

3708. LEYTON, L. **Aeration and root growth in tree seedlings**. [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO/56/21/5*, 1956. pp. 4. [Department of Forestry, University of Oxford.]

Describes an experimental technique devised for studying the oxygen requirements of roots of tree seedlings. Studies have been completed on Norway Spruce, Scots Pine, and Willow (*Salix atrocinerea*). In both Spruce and Pine, reduction in the supply of O to the roots caused a marked reduction in growth, and complete exclusion of O stopped growth entirely and, if maintained for more than 24 hours, killed the seedling. In the case of Willow, reduction in O supply decreased root growth by ca. one-half, but there was no obvious difference with different reduced levels of O, and in the complete absence of O the rate of growth was similar to that with a gas mixture containing 10% O_2, nor did the maintenance of anaerobic conditions over a period of 6 days appear to have any ill effects on the seedlings.

3709. LJUBIČ, F. P. O prisposoblenii duba čereščatogo (*Quercus robur* L.) k pitaniju zasolennymi gruntovymi vodami v uslovijah deljty Volgi. **[The adaptation of Pedunculate Oak to saline groundwater in the conditions of the Volga delta.]** *Dokl. Akad. Nauk SSSR* 107 (1), 1956 (175–7). 4 refs. [Russ.] A.P.B.

Reports briefly [no statistical data] on studies made in 1950–54 near Astrakhan. Observations were made in the field, of shoot growth in trees 1–6 and > 150 years old, grown on alluvial soil with groundwater of various degrees of salinity lying at depths of 1·5–3 m. Growth of the trees was satisfactory with Cl concentrations as high as 0·03–0·08% in the soil (0–150 cm. layer) and 1–5 g./litre in the groundwater; but higher concentrations checked growth. Excavations showed that a considerable portion of the root systems were in direct contact with the groundwater. Some experiments were also made with seedlings transplanted into pots, the bases of which were kept immersed for 10–20 days in samples of natural groundwater in containers protected against evaporation and overheating by the sun. Contents of Cl, SO_4 and Ca ions in the soil (*a*) and groundwater (*b*), before and after the test, are tabulated. All seedlings grew satisfactorily despite final Cl concentrations of 0·7–0·8% in (*a*) and 5–6 g./litre in (*b*). Analyses of slight deposits on leaf surfaces in the pot- and field-grown trees, indicated that excess salts are excreted through the leaves.

3710. FALCK, R., and FALCK, M. Die Bedeutung der Fadenpilze als Symbionten der Pflanzen für die Waldkultur. **[The importance for forestry of filamentous fungi as symbionts of [higher] plants.]** J. D. Sauerländer's Verlag, Frankfurt a/M. 1954. pp. 91. 27 refs. [G.g.e.] Price *DM*.8·80.

Chiefly a discussion of various theories on mycorrhizae, and a restatement of the first author's theories and findings on the role of mycorrhizae in the metabolism of higher plants, and the formation and decomposition of humus, particularly the breakdown of cellulose and lignin in the forest.

3711. Sobotka, A. Umělá mykorrhizace sadebního materiálu. **[Artificial production of mycorrhizae on planting stock.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 28 (1), 1955 (67–74). 8 refs. [Cz.cz.russ.]

To obtain pure mycelia for inoculation work, the author isolated the various cultures on an agar medium (malt or synthetic), from which they were subsequently transferred to a synthetic liquid medium on which they multiplied very rapidly. Finally the cultures were transferred with 2% glucose (*a*) into peat (*Amanita pantherina* and *Boletus edulis*), (*b*) to Larch and Spruce fallen needles (*Ixocomus elegans*), (*c*) into fallen and cut Spruce and Pine needles (*Ixocomus variegatus*). [Cf. *For. Abstr.* 17 (No. 1335).]

3712. Pachlewski, R. Badania mikotrofizmu jodły pospolitej (*Abies alba* Mill.) w naturalnych zespołach Gór Świętokrzyskich. **[Investigations on the mycotrophy of *A. alba* in the natural communities of the Swiętokrzyskie Mts.]** *Roczn. Nauk leśn.* No. 11, 1955 (111–29). 13 refs. [Pol.pol.russ.g.] (*Prace Inst. bad. Leśn.* No. 139.)

No endotrophic mycorrhizae could be found in either seedlings or old trees; the ectotrophic mycorrhizae always present display different forms (subtypes) related to different plant communities. Sometimes only one species (e.g. *Mycelium radicis atrovirens*) forms mycorrhizae on certain areas of a nursery. Pseudo-mycorrhizae in all axes of the root system were frequently observed.

3713. Harley, J. L., McCready, C. C., Brierley, J. K., and Jennings, D. H. **The salt respiration of excised Beech mycorrhizas. II. The relationship between oxygen consumption and phosphate absorption.** *New Phytol.* 55 (1), 1956 (1–28). 23 refs. [Department of Botany, Oxford University.] O.R.S.

Consumption of O by freshly excised mycorrhizae was shown to depend, over a wide range, on external O concentration. Phosphate uptakes of entire fresh mycorrhizae, their constituent tissues, and free cores of host tissue were independent of O concentration above 1%, only when very low external phosphate concentrations were supplied. With sufficiently high phosphate concentrations, phosphate uptake and O consumption appeared to be directly correlated. The effects of NaN_3, 2,4-dinitrophenol and KCN were studied. These stimulated O consumption and CO_2 emission (to a greater degree in stored than in fresh roots) and diminished phosphate consumption. When phosphate was supplied to stored roots, the extra O consumed was dependent on the concentration of phosphate, the ratio varying with length and conditions of storage of the mycorrhizae.

3714. Jeník, J. Původce a ekologický význam hlízek na kořenech olše. **[The symbiont causing root-nodule formation in Alder and the ecological significance of the nodules.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 28 (3), 1955 (375–84). 27 refs. [Cz.cz.russ.g.]

The nodules are modified additional roots infected by the endophyte *Plasmodiophora alni*, of the order Plasmodiophorales. The endophyte lives in the bark cells of the nodules, and passes the three stages of its life cycle there; during the last stage, small bacterioid bodies formed in the sporangium, pass from the nodules into the soil and infect the meristematic tissues of the growing roots. N fixation by this endophyte is probable, but not yet definitely proved.

3715. Enescu, V., Enescu, V., Damian, M., Săvulescu, A., and Stanciu, N. Contribuţii la studiul sistemului de înrădăcinare a cîtorva specii de arbori şi arbuşti de pe lăcovişte. **[The root system of certain species of trees and shrubs on marshy soils.]** *Bul. şti. Acad. Repub. rom.* (*Sect. Biol.*) 7 (4), 1955 (945–80). 17 refs. [Rum.russ.f.] O.R.S.

The studies were made in mixed woodland growing on a flat area, crossed by many drainage ditches and with a high water-table. The soil profile consists of an A horizon 20–30 to 60–70 cm. deep, black when wet and ash-coloured when dry, an A/G horizon 10–20 to 45–55 cm. deep; and a more or less impermeable gley horizon. Studies were made, and detailed drawings are given, of the root systems of a number of trees and bushes, in order to determine the effect of shallow rooting depth upon their development. The species investigated were *Quercus robur*, *Ulmus foliacea*, *Fraxinus excelsior*, *Alnus glutinosa*, *Populus tremula*, *Cornus sanguinea*, *Corylus avellana*, *Rhamnus frangula*, *Euonymus europaeus* and *E. verrucosus*, *Viburnum lantana* and *Crataegus monogyna*. All species displayed abnormal root systems, the abnormalities being greatest for those species that normally form a tap-root or tap-root plus lateral roots (Oak, Alder, *Cornus*, Hazel, Spindle), and less for those that habitually form a more or less superficial root system (Aspen, Ash, Elm, Privet). It was found that Oak formed four types of root system according to varying soil conditions, all characterized by lack of a tap-root: (*a*) with an effective rooting depth of 30–40 cm. black soil, a radial spreading system; (*b*) with an effective rooting depth averaging 20–40 cm. (30–40 cm. above water-table in dry weather and 5–10 cm. in wet) a system of superficial ‘buttress’ roots spreading to a distance of 14–18 m.; (*c*) with 30–40 cm. of peaty soil above a strongly gleyed horizon, an unorganized fasciculate mass of roots; and (*d*) with 100–110 cm. rooting depth an intermediate system with spreading roots and sinkers. Illustrations have legends in French.

3716. Joachim, H.-F. Untersuchungen über die Wurzelausbildung der Pappel und die Standortsansprüche von Pappelsorten. **[Investigations into Poplar root development and the site requirements of Poplar varieties.]** *Wissenschaftliche Abhandlungen, Deutsche Akademie der Landwirtschaftswissenschaften, Berlin* No. 7, 1953. pp. 208. 55 refs. [G.g.]

Describes, with many illustrations, the root development—e.g. structure, size, density, length, depth and horizontal spread in relation to tree height and crown size—of 12 Poplar varieties (6 forms of × *P. euramericana*, *P. nigra* var. *italica*, × *P. berolinensis*, *P. trichocarpa*, *P. candicans*, *P. tremula* and *P. canescens*) occurring in N.E. Germany, in relation to sites ranging from waterlogged to dry, from nutrient-rich to nutrient-deficient sands, including spoil mounds and gravel pits. A supplementary investigation deals with the root development of 1-year-old cuttings in various nursery soils. Independently of soil conditions, the root development of *P. trichocarpa* was different from that of the Black Poplars, being characterized by an extensive, mostly horizontal system, derived chiefly from roots originating in the bark of the cuttings, whereas, for example, × *P. robusta* tended to form a deeper, more intensive system from 'wound roots' derived from the callus. Root development and growth are closely connected on all sites. The site requirement and optimum spacing of a number of varieties and their suitability for certain sites, including some not usually considered promising, are discussed and some recommendations made (e.g. × *P. robusta* for sandy sites without groundwater and for spoil mounds).

3717. Zahner, R. **Root development of thinned Pines.** *Sth. For. Notes Sth. For. Exp. Sta.* No. 101, 1956 (1–2).

When a 9-year-old Loblolly plantation was thinned from 1100 to 100 trees/acre, well developed root systems, originally reaching ca. 3 ft. from the tree, extended to ca. 6 ft. in two growing seasons. Development was inferred from soil moisture measurements 18 in. below the surface.

181.4. Reaction to Biotic Influences (Competition etc.) and Fire

See also Nos. 3743–4, 3769, 3930.

3718. Bruce, D. **Effect of defoliation on growth of Longleaf Pine seedlings.** *For. Sci.* 2 (1), 1956 (31–5). 2 refs.

Natural seedlings of *P. palustris* are subject to defoliation by fire and fungus during the grass stage (2–30 years). The effect on the height and diameter growth of 18-month nursery seedlings of clipping off 30, 60 and 90% of the foliage was investigated. Clipping was done once in July, November or the following February, or twice in various combinations. All defoliation caused loss of growth in rough proportion to severity; degree of clipping was more significant than the date, and two-stage clipping was generally worse than one 90% clipping. November was significantly worse than July clipping, and February clipping caused least damage, an endorsement of the practice of deferring controlled burning to January or February. [Cf. *For. Abstr.* 16 (No. 630).]

3719. Little, S., and Somes, H. A. **Buds enable Pitch and Shortleaf Pine to recover from injury.** *Sta. Pap. Ntheast. For. Exp. Sta.* No. 81, 1956. pp. 14. 7 refs.

In 1953, leaders and upper laterals of 4 trees, 3–6 ft. tall, of each species were clipped, removing most of the 1953 growth, or that of 1953 and some of that of 1952; in the spring of 1954 needle-fascicle buds developed on all trees on practically all clipped shoots, first-year growth being good on stems where only part of the 1953 growth had been removed, and about half the normal on those from which all the 1953 and part of the 1952 growth had been removed. The development of dormant buds at the nodes and at the base, and the effect of a strong basal crook in protecting dormant buds against fire by bringing them below the litter, are discussed, and the progress in the formation of such crooks on different types of site and in nursery stock as compared with wildings is described. In 1955, 100 Shortleaf and 98 Pitch Pine seedlings of different root-collar diameter classes were subjected to prescribed burning. Sprouting after the fire increased with increasing root-collar diameter and with increasing amount of basal crook. Seedlings of the two species have similar sprouting ability when of the same vigour and on the same site. A study of increment cores taken at 9 in. above the ground from trees of both species with sprouts of known origin (after a fire or cutting), showed that the sprouts started at 8–36 years and at 22–79 years for Shortleaf and Pitch Pines respectively. Borings taken along the boles just below living dormant buds in 10 trees of each species indicated that the Shortleaf Pines were 49–85 years old and the Pitch Pines 44–81 years old at those heights. The earlier seed production by Pitch Pine, especially on sprouts, and its ability to produce sprouts to an advanced age, appear to form a logical basis for explaining the distribution of the two species on upland sites in southern New Jersey.

3720. Jurča, J. Příspěvek k poznání vlivu výstavků na růst mlaziny. **[Influence of seed-trees on the growth of young trees.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 28 (4), 1955 (629–34). 8 refs. [Cz.cz.russ.g.]

Thirty seed-trees/ha. were left in a young forest (mainly Hornbeam and Oak). The mean and maximum heights of the young stand within a radius of 6 m. from the seed trees, were 0·46 m. (18·5%) and 0·59 m. (14·5%) less, respectively, than those of the adjacent stand in a ring 6–12 m. from the seed-trees.

181.5. Reproductive Behaviour

See also Nos. 3642–3, 3648, 3697, 3703, 3708, 3719–20, 3743, 3795 *et seq.*, 3987, 4324.

3721. Parodi, L. R. La floración de la tacuara brava (*Guadua trinii*). **[Flowering of *G. trinii*.]** *Rev. argent. Agron.* 22 (3), 1955 (134–6). [Span.] E.M.B.

Notes on gregarious flowering in 1953, at the age of 30 years, of *G. trinii* in the Botanic Garden of the Facultad de Agronomía y Veterinaria, Buenos Aires. At the same time flowering was also observed in the same species growing under natural conditions in the Paraná Delta.

3722. Tsoumis, G. T. Ho chronos ōrimaseōs tōn spermatōn tēs aeithalous kyparissou. **[The time of maturity of the seeds of Mediterranean Cypress.]** The Author, Thessalonika. 1954. pp. 12. 8 refs. [Gk.e.] [University of Thessalonika.]

Some 10–15 maturing cones were collected from each of several trees of *Cupressus sempervirens* var. *horizontalis* and var. *pyramidalis* at about 15-day intervals from May to autumn in 1943, 1944 and 1949 in a Salonika plantation, and the seed extracted, and germinated in Petri dishes in batches of 300 at a time (per tree). Results, tabulated in detail, showed that, for both varieties, the germinative capacity was low or negligible in May but rose through June to a maximum in July and August, although the cones do not, in nature, open till October; an indication of summer maturity supported by such secondary indications as seed colour and sp. gr., and the moisture content of the cones. A subsidiary test with seed collected from 1935 onwards showed that seed of both varieties of Cypress can remain viable up to at least 14 years.

3723. Crossley, D. I. **Fruiting habits of Lodgepole Pine.** *Tech. Note For. Br. Can.* No. 35, 1956. pp. 32. 6 refs.

Lodgepole Pines are reputed to store large amounts of viable seed in their persistent serotinous cones. Such storage can be of immense assistance in the management of a forest, and in order to obtain more detailed knowledge of the nature and amounts available, a detailed study was undertaken on the Kananaskis Forest Experiment Station in the subalpine region of Alberta. The persistent cone crop borne on individual open-grown and stand trees was tallied in detail, as well as the relationship of the crops borne to stands, and to size and crown classes within the stands. Three different age classes of stands were examined, namely juvenile (17 years), immature (55 years), and overmature (140–250 years). The results of the investigation are summarized as follows: (1) Although a single tree usually behaves consistently in the type of cone crop it produces, there is a wide variation between trees. (2) A few trees, at least under stand conditions, apparently are non-fruiting, the % increasing with increased suppression. (3) While pronounced variations can be expected in the size of the annual crop on any individual tree, no years of nil crop on any fruiting tree studied were experienced during at least the past 20 years. (4) Individual cones of Lodgepole Pine are either non-serotinous or serotinous. That is, they open immediately they mature, or they remain closed until they are subject to considerable heat (45° C. or more). Such temperatures do not occur in the crowns of trees under natural conditions. (5) Individual trees can bear all, or practically all, their cones closed, or all their cones open, or they can bear a mixture. However, the pattern, once set, remains unchanged for many years. (6) The great majority of trees in juvenile stands (17 years) bore their cones open, while similar majorities in immature stands (55 years) and overmature stands (140–250 years) bore theirs closed. Thus the pattern reversed between the 17th and 55th years. None of the trees in the overmature stands could be classed as open-coned. (7) The habit of bearing open or closed cones does not appear to have any connexion with the amount of lime in the soil, or the existing moisture conditions, as has been suggested. It appears more likely to be an inherited characteristic. (8) There is an annual release of seed, at the time of cone ripening, from non-serotinous cones. Previous seed-trap studies indicate that the quantities of seed from such a source in a stand of Lodgepole Pine are quite light, and the present study suggests that the amount decreases as the stand gets older. (9) Fruiting habits of stand trees vary in a similar fashion to those of open-grown trees, with the exception that individual stand trees bear smaller quantities of cones. (10) If 'suppressed' trees are left out of account, the evidence obtained did not suggest any relationship between the size of cone crop and crown position in the stand. Since the sample was small, this conclusion should be treated with caution. (11) Under immature-stand conditions the dominant trees exhibit the greatest % of closed-cone trees. This % decreases with increasing suppression (or with decreasing diameter class). (12) The ability to produce cones appears at a very early age in Lodgepole, although the % of cone-bearing trees decreases, at least in sapling stands, with major increases in altitude. At elevations between 4800 and 5700 feet, cone-bearing became general by the time trees reached a height of 7 ft. (13) Since young stands are not prolific fruiters, and since very few of the cones are serotinous, it is suggested that adequate reproduction following fire would be unlikely. (14) Since the trees in mature stands fruit prolifically, and since most of the cones borne are serotinous, fire will usually leave an adequate, if not superabundant, supply of seed available for regeneration. While a similar supply of seed is available on overmature Pine it must not be forfotten that such stands are breaking up and the % of Pine in comparison to other species is rapidly diminishing. Under such conditions the available supply of Pine seed will be considerably less. (15) In shelterwood or seed-tree fellings where trees are to be relied upon to seed annually, those classed as open-coned will be the most efficient and should be reserved. *From author's summary.*

3724. Lyons, L. A. **The seed production capacity and efficiency of Red Pine cones (*Pinus resinosa* Ait.).** *Canad. J. Bot.* 34 (1), 1956 (27–36 + 3 photos). 18 refs. (*Contr. Div. For. Biol. Dep. Agric. Can.* No. 236.) O.R.S.

The seed capacity of Red Pine cones varies from about 30 to over 110, depending on the size of the cone and its position in the tree crown, and is determined by the number of ovules structurally complete at the time of pollination. These ovules occur in a central 'productive' region and constitute less than ½ the total. The others, most of which are in the proximal part of the cone, never become structurally perfect and do not contribute to seed production. Abortion of ovules in the productive region generally reduces seed production efficiency to 50–60% and is accompanied mainly by withering of the nucellus in the first year and failure to produce archegonia early in the second year. The extent of ovule abortion during the first year varies indirectly with cone size, seed capacity and height in tree. *From author's summary.*

3725. Boyer, W. D. **Time of Longleaf [*Pinus palustris*] seedfall.** *Sth. For. Notes Sth. For. Exp. Sta.* No. 102, 1956 (3).

In a better than average crop in S. Alabama, the first viable seed was trapped on 14 Oct., and the last on 6 Feb., the bulk falling between 24 Oct. and 21 Nov., 1955.

3726. **Abnormal seedlings produced by immature seed.** *Rep. Calif. For. Range Exp. Sta. 1955* [1956] (14–5).

Cones of Ponderosa, Sugar and Jeffrey Pines were collected in Sept. and Oct. 1952 and segregated into 4 specific-gravity classes, 2 above and 2 below the sp. gr. index of mature cones (0·68 for Ponderosa and 0·80 for Sugar Pine). Germination tests were made in the springs of 1953 and 1955. A great deal of abnormal germination (illustrated) was found to be associated with immature seed of Jeffrey and Sugar Pine, occurring in fresh more than in stored seed. Nearly ½ the total of Sugar Pine and ⅓ that of Jeffrey Pine seedlings from immature fresh seed were abnormal.

3727. SCHUBERT, G. H. **Effect of ripeness on the viability of Sugar, Jeffrey, and Ponderosa Pine seed.** *Proc. Soc. Amer. For. 1955*, 1956 (67–9). 5 refs.

Experiments confirmed previous findings for *Pinus lambertiana* and *P. ponderosa*, the cones of which did not begin to open on the trees until their specific gravities had dropped below 0·62. None of the *P. jeffreyi* cones had started to open during the collection period, although the sp. gr. of some had dropped to 0·61. Since the sp. gr. index for mature cones is 0·8 for *P. lambertiana* and ca. 0·86 for the other two species, there is a considerable range of sp. gr. during which seed can be safely collected. During germination tests it was noticed that germination of immature seed of *P. lambertiana* and *P. jeffreyi* resulted in many abnormal seedlings. Seed testers should be very careful to note and record the worthless abnormal germinates, which can easily be overlooked during routine germination tests. Such an oversight could result in an overestimate of the effective germinative capacity of the seed.

3728. BRENDER, E. V., and BARBER, J. C. **Influence of Loblolly Pine overwood on advance reproduction.** *Sta. Pap. Stheast. For. Exp. Sta.* No. 62, 1956. pp. 12. 1 ref.

The survival and growth of *Pinus taeda* seedlings in the lower Piedmont region of Georgia were measured on 79 quarter-acre plots of widely differing site and stocking conditions. While all understorey seedlings are markedly less tall than free-growing ones, large increases in overstorey density had no great further effect, the level of shade, i.e. the height of the lowest branches of dominant and co-dominant crowns, having a much greater effect on both growth rate and survival. In a stand of Stand Density Index (SDI) 40 (equal to 40 trees of 10 in. d.b.h./acre) and shade level 20 ft., no seedlings beyond the age of 8 were found, while in a stand of SDI 220 and shade level 40 ft., ten-year-old seedlings maintained themselves. The interrelationships of crown ratio, stand density, and age, in the overstorey on the one hand and of seedling height and age, overwood density and level of shade on the other, are given in regression equations, and the implications of these findings on shelterwood methods of regeneration are discussed.

3729. KORSTIAN, C. F., and BILAN, V. **Some further results on competition between Loblolly Pine and associated hardwoods.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/21/9, 1956. pp. 4. 4 refs.

Earlier studies have shown the importance of competition for both moisture and light in the survival of *Pinus taeda* regeneration in the face of competing hardwoods [cf. *For. Abstr.* 1 (p. 29); 6 (p. 75); 14 (No. 1052)]. A further study was initiated in 1951 in Duke Forest. Sixty *P. taeda* seedlings, 7 years old, were selected from an even-aged stand of Pine and hardwoods, and twenty randomly allocated to each of 3 treatments: (*a*) reduction of crown and root competition by poisoning all woody plants within 33 in. of the Pines, (*b*) reduction of crown competition by tying back all woody plants capable of shading the Pines, and (*c*) unrestricted competition from hardwoods (control). Because of the high site-quality of the area, root competition in this experiment is mainly in terms of soil moisture. Light intensity was 73% of full sunlight for treatments (*a*) and (*b*) and 35% for treatment (*c*). Height and diameter growth were recorded for 4 successive growing seasons. In the first 2 seasons, growth of (*c*) was significantly less than that of (*a*) or (*b*) which did not differ significantly from each other. At this point, (*a*) was modified by poisoning all woody plants to a distance of 12·5 ft. from the Pines. Analysis of the results at the end of 4 years gave mean height growth of (*a*), (*b*) and (*c*) in inches as 98·7, 84·5, and 60·9 respectively, and corresponding diameter growth at 1 in. from ground as 2·34, 1·67, and 0·94. Since there was no significant difference in the intensity of light available to the Pines in (*a*) and (*b*), the differences in growth between them can be attributed to differences in soil moisture; the difference in light intensity apparently accounts for the variation in growth between (*b*) and (*c*). The combined effect of deficient light and soil moisture was reflected in the growth and general appearance of the treated and control Pines: most of the former appeared healthy and vigorous with well developed leaders, long crowns and dark green needles pointing upward, while the latter were unthrifty and chlorotic in appearance and 3 were dead.

3730. MESHECHOK, B. Litt om mosedekkets rolle for naturlig foryngelse i granskog. **[The effect of the moss layer on natural regeneration in Spruce forest.]** *Norsk Skogbr.* 2 (11), 1956 (354 . . .361, 377–8). 18 refs. [Nor.]

In laboratory experiments Spruce seeds were allowed to germinate in conditions of stable temperature and humidity, similar to those for seeds germinating in the moss cover. Seeds germinating in strong light (as on top of the moss cover) produced plants with a short hypocotyl; those germinating in reduced light (as within the moss cover) produced weak plants with a long hypocotyl. In two series of experiments in the forest, seed was scattered on the moss cover and on patches from which the moss had been removed without disturbing the underlying raw humus. Seedling counts in the autumn after sowing and in subsequent years showed very few plants on the moss cover compared with the cleared patches (2 and 179 respectively on 38 quadrats each, 2 years after sowing, at Trysil). Natural regeneration after the 1954 seed-year was also higher on the cleared patches. The temperature in the upper 0·5 cm. of the raw-humus layer proved to be considerably higher than where its moss cover had been left intact; removal of bilberry [*Vaccinium myrtillus*] growth had less effect on temperature. Moss should be removed only from small patches for fear of unfavourable effects on moisture. The survival of Spruce seedlings under dense forest and the effect of clear felling on such advance growth are discussed.

3731. QUICK, C. R. **Viable seeds from the duff and soil of Sugar Pine forests**. *For. Sci.* 2 (1), 1956 (36–42). 13 refs.

Brush regeneration following logging has long been a nuisance in the Sierra Nevada of California. Here 64 samples of duff down to the mineral soil, each representing 1/50,000 acre, were taken from virgin mixed conifer forest, sieved, and the seed concentrated, variously treated (stratification, hot water) and sown in sterile sand supplied with nutrients. Germinations were ca. 2·82 million/acre and contained *Ceanothus* (3 spp.) 2·01, various dicotyledons 0·475, *Ribes* 0·16, grasses 0·155, and *Arctostaphylos* spp. 0·1 million.

181.6. Life Form, Habit. Post-Seedling Development and Form

See also Nos. 3907, 3940, 4054, 4264.

3732. CARVELL, K. L. **Summer shoots cause permanent damage to Red Pine**. *J. For.* 54 (4), 1956 (271).

During a late rainy period in the dry summer of 1953, it was observed that 19% of trees in 6-year-old *Pinus resinosa* plantations in W. Virginia had one or more lammas shoots. This growth was almost entirely restricted to the largest and most vigorous trees. Examination of these plantations in spring 1955 showed that 76% of such trees now had two or more strong leaders that would produce a permanent fork in the stem. The terminal axis had maintained dominance on the remaining lammas-shoot trees, but these shoots had formed large ascending branches that would live for years and eventually act as avenues for decay to enter the stem.

3733. SCHLÜTER. Einige abnorme Triebbildungen der Kiefer und ihre waldbauliche Bedeutung. [**Some abnormal shoot formations in Pine, and their silvicultural significance.**] *Forst- u. Holzw.* 11 (11), 1956 (219–26). [G.g.]

Describes and illustrates a number of shoot malformations, such as forking, an excessive number of secondary shoots between the main whorls, abnormal lammas shoots, e.g. candelabra and asymmetrical forms, and also malformations caused by external injury. Causes, effects on future stem form, and silvicultural treatment to minimize these defects are discussed.

3734. MIEGROET, M. VAN. Die Bestimmung der Ästigkeit in Dickungen. [**The evaluation of branchiness in thicket-stage stands.**] [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/23/9, 1956. pp. 7. [G.]

Develops and illustrates with measurements of 5 young trees each of *Pinus sylvestris* and *P. nigra*, a formula for evaluating the branchiness of young trees or stands: $\frac{25\,\Sigma\, d^2}{HD}$ where d is the basal diameter of a branch, D = stem diameter at mid-height, and H is tree height.

3735. NEWMAN, I. V. **On fluting of the trunk in young trees of *Pinus taeda* L. (Loblolly Pine)—with an appendix on the measurement of radial growth as ring-width**. *Aust. J. Bot.* 4 (1), 1956 (1–12 + 4 plates). O.B.D.

Grooves found in stems of young *Pinus taeda* in Queensland are due to the suppression of radial growth both above and below the base of the branch insertion. Whether growth inhibition has an internal physiological or external infective origin is not clear. This suppression, chiefly of early wood, operates for 2–3 years and differs from the very slightly extended suppression associated normally with dead branch bases. Both the quantity and the structure of the cells formed are affected by a pathological condition of the cambial zone. Whether the fluting follows a spiral course depends on whether the grain was inclined or not at the time the suppressive factor was operating. In 2 logs examined, suppression occurred only in the growing seasons beginning 1948, 1949 and sometimes 1950. After that the depressions were being obliterated by local excess of radial growth. In a note on measurements of radial increment at a grooved surface, of the 3 possible measurements of ring-width, viz. 'radial' (along the radius of the tree as a whole), 'histological' (along the direction of the rows of wood cells), and 'apparent' (along the shortest distance across the ring), the histological ring-width is suggested as most correctly representing radial increment. *From author's summary.*

181.7. Duration, Longevity, Stature; Records of Exceptional Age or Size. Effects of Age on Behaviour

3736. **Report on American big trees.** *Amer. Forests* 61 (9), 1955 (32–40); 62 (4), 1956 (33–40).

Lists the largest known individuals of a large number of species, with dimensions of g.b.h., height, and crown diameter, with location.

181.8. Phenology

See also Nos. 3624, 3627, 3631, 3702, 3732, 3837.

3737. BALDWIN, H. I. **The period of height growth in different provenances of European Larch.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/22/15, 1956. pp. 8 + 2 gphs. 7 refs.

Weekly measurements of the height growth of young Larch over a 2-year period failed to reveal noteworthy differences in growth period of trees originating in different countries, latitudes and altitudes. Growth continued for 15 weeks, 90% occurring in 9 weeks. Height growth began a month after the appearance of new foliage. *From author's summary.*

3738. **Seasonal distribution of leader and radial growth [of saplings of Western Hemlock and Sitka Spruce.]** *Sta. Pap. Alaska For. Res. Cent.* No. 2, 1955 (24). (*Rep. Alaska For. Res. Cent. 1954.*)

Gives data for one year from the Ketchikan area of the Tongass National Forest.

181.9. Miscellaneous. (Including the Ecological Role after Death of Plants or Parts of Plants, e.g. Dead Trees, Stumps, Fallen Logs)

See Nos. 3587, 3697, 4096.

182. Synecology, Plant Sociology: General, Principles and Methods

182.1. Palaeoecology. History of Vegetation

See also Nos. 3636, 3700, 3753.

3739. GUINIER, P. Le hêtre de la forêt de Valbonne est une relique glaciaire. **[The Beech of Valbonne forest is a glacial relict.]** *Rev. for. franç.* 8 (5), 1956 (325–9). 3 refs. [F.]

Cf. *For. Abstr.* 16 (No. 2532), 17 (No. 2596).

3740. HERVÉ, P. À propos du hêtre de Valbonne: considérations entomologiques. **[The Valbonne Beech: entomological considerations.]** *Rev. for. franç.* 8 (5), 1956 (330–4 + 5 drawings). [F.]

Consideration of the insect fauna of these Beech woods gave negative results, but rather in favour of their being natural than otherwise.

182.2. Succession, Alternation and Periodicity in Vegetation

See also Nos. 3587, 3616–7, 3757, 3765–6, 3769, 4212.

3741. RAUP, H. M. **Vegetational adjustment to the instability of the site.** [*Pap.*] *6th tech. Mtg. int. Union Prot. Nature, Edinburgh 1956* No. *IUPN/A.G.5/R.T.6/I/7*, 1956. pp. 16. 30 refs.

The author illustrates his thesis by discussing some actual examples: (1) the zonation of lake shore in Lake Athabaska; (2) the tundra vegetation of the arctic; (3) the forests of Honduras; (4) the forests of New England. Ordinary concepts of climax vegetation with dominant species will not fit any of these, which display a mosaic-like distribution, due in the case of (1) to gradual drying, in (2) to frost-heaving, and in (3) and (4) to the pitting and mounding of the soil caused by storm damage [cf. *For. Abstr.* 16 (No. 4168); 17 (No. 3587)].

3742. LÜDI, W. Die Neubildung des Waldes im Lavinar der Alp La Schera im Schweizerischen Nationalpark (Unterengadin). **[Natural reforestation on the site of an avalanche on Mt. La Schera in the Swiss National Park (Lower Engadine).]** *Ergebnisse der wissenschaftlichen Untersuchungen des schweizerischen Nationalparks* (*n.s.*) 4 (30), 1954 (279–96). 1 ref. [G.g.] (Kommission der Schweizerischen naturforschenden Gesellschaft zur wissenschaftlichen Erforschung des Nationalparks, Nationalpark-Museum, Chur.) Price *Fr.*1·50.

Describes the changes in vegetation disclosed by surveys in 1939 and 1949 on the site of an avalanche that had destroyed a sub-alpine forest in 1917. The neighbouring forest consists chiefly of *Pinus mugo* var. *rostrata*, with some *Larix decidua* and a few *P. cembra*. The general impression was still that of open country, with *P. mugo* scattered singly or in groups, some of which have reached a height of over 4 m., and isolated *P. cembra*, *L. decidua* and *Picea abies*. In the transect analysed, tree individuals had increased by 50% and their mean heights from 97 cm. to 167 cm., over the 10-year period. Ground cover, mostly dwarf shrubs, had also increased. [Cf. *For. Abstr.* 16 (No. 2800).]

3743. TEVIS, L., JR. **Pocket gophers and seedlings of Red Fir.** *Ecology* 37 (2), 1956 (379–81). 19 refs. [Department of Zoology, University of California, Davis, Calif.]

A high ridge between the New and Trinity rivers in N.W. California was originally covered with a turf of Idaho fescue (*Festuca idahoensis*) which prevented the spread of conifers. At the turn of the century, Indians from the Hoopa Reservation began to pasture large numbers of cattle on this mountain range, resulting in the gradual destruction of the turf and multiplication of deep-rooted and bulbous plants. Then pocket gophers (*Thomomys monticola*) responding to a new supply of food, increased in numbers. Their burrowing accelerated deterioration of the range, but their removal of vegetation and their churning of the ground produced an ideal seedbed for conifers. In 1951, Red Fir (*Abies magnifica*) set a bumper crop of cones. In the following spring, enormous numbers of seedlings came up. Mortality was high, and after two years, abundant survivors were found only on bare ground not visited by the rodents. In brushfields and forest, young trees disappeared because of shade and competition from other plants. The seedling survivors, however, were sufficiently numerous to indicate that much of the range is destined to become forest. A reversal of this present trend in ecological succession will require reduction in numbers of livestock and gophers, and sowing of bare areas with grass. *From author's summary.*

3744. LUTZ, H. J. **Ecological effects of forest fires in the interior of Alaska.** *Tech. Bull. U.S. Dep. Agric.* No. 1133, 1956. pp. 121. 165 refs.

A more fully documented version of the study published earlier [see *For. Abstr.* 16 (No. 265)].

3745. SHIELDS, L. M., and CRISPIN, J. **Vascular vegetation of a recent volcanic area in New Mexico.** *Ecology* 37 (2), 1956 (341–51). 14 refs.

The lava deposit is estimated to be < 1000 years old. *Juniperus monosperma* is the only tree species found on the lava itself, but mature trees of *Populus wislizenii* and *Tamarix gallica* were found on islands left in the volcanic flow.

182.4. Layer Communities

See also Nos. 3582, 3591, 3730.

3746. Reynders, W. J. De mosflora van het Amsterdamse Bos. **[The moss flora of the Amsterdamse Bos.]** *Buxbaumia, Amsterdam* 9 (1/2), 1955 (19–28). 3 refs. [Du.e.] L.S.

Lists and discusses the species found on the ground (these are very few) and the epiphytic flora in a mixed planted forest on clay soil covering some 2000 acres S.W. of Amsterdam. The trees are up to 20 years old. While *Salix alba* and *Sambucus nigra* both have a rich epiphytic flora, epiphytes are so far rare on Oak, Beech, Ash and Maple.

3747. Ştefureac, T. I., Popescu, A., and Lungu, L. Contribuţii la cunoaşterea florei şi vegetaţiei briofitelor din valea lotrului. **[The bryophyte flora and vegetation of the Lotru Valley.]** *Bul. şti. Acad. Repub. rom.* (*Sect. Biol.*) 7 (3), 1955 (525–88). 64 refs. [Rum.russ.f.] O.R.S.

Systematic and ecological studies of the mossy vegetation of Beech or mixed hardwood forests on the southern slopes of the Carpathians. There is a 5-page French summary.

182.5. Synecological Measurements and Methods

See also No. 3768.

3748. Küchler, A. W. **A comprehensive method of mapping vegetation.** *Repr.* from *Annals of the Association of American Geographers* [*Lancaster, Pa.*] 45 (4), 1955 (404–15). 4 refs.

Describes in detail every step of the author's method of mapping vegetation, based on aerial photographs and his physiognomic classification [cf. *For. Abstr.* 12 (No. 993)].

3749. Philippis, A. de, and Gaussen, H. Carte de délimitation et carte écologique. **[Delimitation map and ecological map.]** [*Docum.*] *5th Sess. FAO Jt. Subcomm. Medit. For. Probl., Nice 1956* No. *FAO/SCM/*55, 1956. pp. 22. [F.]

Notes (1) on a provisional map showing the limits of the 'eumediterranean' region (roughly coextensive with Olive cultivation) and 'transitional lands'; and (2) to guide member countries on the construction of ecological maps showing climatic and floristic data.

187. Vegetation Types

See also Nos. 3565–70, 3590, 3618, 3659, 3701, 3818, 4307–10, 4620.

3750. **[Forest types.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 28 (2), 1955 (169–298 + 1 tbl. + 5 maps). Many refs. [Cz.cz.russ.g.]

This number is almost wholly devoted to the problem of forest typology, and contains the following articles: (1) Forest typology from the standpoint of phytocoenology (*J. Klika*); (2) Theoretical premises and practical determination of forest types in the forests of the Brno region (*B. Vincent*); (3) Biocoenological forest investigations (*J. Nosek*); (4) Use of forest types in forest management (*B. Doležal*); (5) Practical justification for fundamental typological forest research, and the survey of forest-type groups in Czechoslovakia (*A. Zlatník*); (6) Forest typology as a basis for future silviculture (*A. Mezera*); (7) Methodological guidance for the investigation and classification of site properties in the forest areas of Czechoslovakia (*J. Pelíšek*); and (8) Forest types in Slovakia (*D. Randuška*), this one article and its summary being in Slovak.

3751. Alexandrowicz, B. W., and Zaręba, R. Typologiczna systematyzacja lasów sękocińskich. **[Typological classification of the forests of Sękocin [near Warsaw].]** *Roczn. Nauk leśn.* No. 8, 1955 (109–78 + 1 dgm. + 1 tbl.). 22 refs. [Pol.pol.russ.e.] (*Prace Inst. bad Leśn.* No. 130.)

A detailed description of soil and vegetation on 113 circular plots, 26–50 m. diam., in an area totalling ca. 619 ha., of which ca. 561 ha. are under forest. Following the Soviet typologist Pogrebnjak, 3 broad soil-fertility series are distinguished, viz. coniferous forests (*Vacciniosa*), mixed forests (*Pteridiosa*) and broadleaved forests (*Urticosa*), which are further subdivided on the basis of five soil-moisture classes. The specific forest types and forms were coded on Cajander's principles. The authors found that, in several decades, forest management had not done justice to the natural properties of the site. They recognize on each of Pogrebnjak's types the following species: (1) 'leading' species which are the true creators of the natural environment, (2) substitute species which replace (1) when these disappear; (3) associated species which have no decisive effect on the environment, and, if present in large numbers in the upper storey, result in the appearance of 'forms' (corrupted modifications of the biocoenosis); and (4) accidental species. It is stressed that only the economically valuable main species belonging to (1) and (2) should be selected; all other species of (1) and (2) are to be looked on as *admixture* species, whereas (3) and (4) can only be *subsidiary* species.

3752. Malmström, C. Kort översikt över svenska skogssamhällen. **[A brief review of forest types in Sweden.]** *Medd. SkogsforsknInst., Ser. Uppsatser* No. 42, 1956. pp. 23. [Sw.] Price *Kr.*1 (*Repr.* from *Kort handledning i Skogshushållning.* Norrlands Skogsvårdsförbund, Stockholm, 5th ed.)

The principal divisions described are: (1) coniferous forest: (*a*) rich in lichens; (*b*) rich in mosses; (*c*) swamp forest rich in mosses; and (*d*) without ground vegetation; (2) deciduous forest: (*a*) Birch; (*b*) Beech; (*c*) Oak and mixed forests including Oak; (*d*) Aspen; and (*e*) Alder. Subdivisions of types (1) (*b*) and (1) (*c*) are also described.

3753. Sauer, E. Die natürliche Holzartenzusammensetzung einiger Waldgesellschaften im Flachland der niederrheinischen Bucht östlich Köln. **[The natural woody species composition of some forest plant communities in the lowlands situated in the bend of the lower Rhine, eastwards of Cologne.]** *Ber. dtsch. bot. Ges.* 69 (3), 1956 (109–20). 23 refs. [G.] O.B.D.

A reconstruction based both on the present vegetation and on pollen profiles.

3754. Hartmann, F. K. Waldgesellschaften der deutschen Mittelgebirge und des Hügellandes.

[Forest plant communities of the mountains and hills of Central Germany.] *Umschaudienst des Forschungsausschusses 'Landschaftspflege und Landschaftsgestaltung' der Akademie für Raumsforschung und Landesplanung, Hannover* No. 4/6, 1953 (147–82 + 51 + 23 tbls.). 111 refs. [G.] Price [10*s*.].

A detailed study culminating in 16 systematic schemata down to sub-associations and sometimes variants of these, giving indications of regional, altitudinal and topographical distribution, soil and water characteristics, and recommended tree species.

3755. Klausing, O. Klimatisch-bodenkundliche Gliederung der natürlichen Eichen- und Buchenwälder in den deutschen Mittelgebirgen. Eine ökologische Betrachtung zum Klimaxproblem. **[Climatic and soil relationships of the natural Oak and Beech forests in the German central range. A contribution to the problem of the climax.]** *Ber. dtsch. bot. Ges.* 69 (1), 1956 (3–20 + 2 plates). 20 refs. [G.g.] O.B.D.

Presents the results of investigations into soil pH in the rooting zone of a series of German mountain sites, ranging from the Harz to the southern Schwarzwald. These sites have, for the most part, already been the object of ecological studies on the part of different investigators, who are cited. The data show that in high forest the ecological distribution of the most important species (Silver Fir, Beech, Oak, Hornbeam and Birch) can be clearly defined on the basis of mean annual temperature and soil acidity. The individual species occur in regular associations, i.e. recognized high-forest types. A chart is presented showing the distribution of these types as determined by mean annual temperature and soil pH. The high forest, although interspersed with other types of forest, is considered to be the nearest to the natural climax. A knowledge of climate and soil acidity can therefore be used as an indicator when choosing species for different sites.

3756. Bodeux, A. La chênaie sessiliflore de Haute-Campine. **[The Sessile Oak forests of the Upper Campine.]** *Repr.* from *Agricultura, Louvain* (*Sér. 2*) 2 (1), 1954 (3–46 + 3 tbls.). 27 refs. [F.f.flem.e.g.] In *Opera Collecta Cent. Bosbiol. Limburgse Kempen* Vol. 2, 1956.

Describes the principal types of vegetation, the history of the forests and their ecology, the distribution of Sessile Oak, the main relict Sessile Oak stands, their recent history, their physiognomy and edaphic characteristics, other forest communities, and the degraded *landes* of the former Sessile Oak forest, their soils, their origin and evolution. The place is also discussed of the Oak stands of the Upper Campine in the whole range of Sessile Oak, and some suggestions are made for their silviculture. The data collected indicate that the forests of the Upper Campine belong to the *Querceto-sessiliflorae betuletum* (Tüxen 1936). It is suggested that the coniferous forests of this region, which have a very low production, should be converted to mixed forest by the addition of certain species chosen from the *Querceto-sessiflorae betuletum.* [Cf. *For. Abstr.* 11 (No. 830).]

3757. Bodeux, A. La chênaie sessile de Haute-Campine et sa lande de substitution. **[The Sessile Oak forest of the Upper Campine and the *lande* that is replacing it.]** *Repr.* from *Vegetatio* 5/6, 1954 (136–41 + 2 tbls.). 27 refs. [F.] In *Opera Collecta Cent. Bosbiol. Limburgse Kempen* Vol. 2, 1956.

A study of the vegetation of the *Calluna* heathland that has replaced the Sessile Oak forest over large areas of this region.

3758. Dethioux, M.-H. Aperçu sur la végétation de la Forêt de Meerdael et des bois environnants. **[The vegetation of the Forest of Meerdael and the neighbouring woods.]** *Communication, Centre de Cartographie phytosociologique et Centre de Recherches écologiques et phytosociologiques de Gembloux* No. 23, 1955. pp. 31 + 3 tbls. 28 refs. [F.f.flem.] (*Repr.* from *Agricultura, Louvain* (*Sér. 2*) 3, 1955 (26–92).)

Distinguishes and describes the following forest associations: hygrophile forest, mesophile forest, silicicolous forest, heath, and Pine forest.

3759. Schwarz, U. Die natürlichen Fichtenwälder des Juras. **[The natural Spruce forests of the Jura.]** *Beitr. geobot. Landesaufn. Schweiz* No. 35, 1955. pp. 143. 210 refs. [G. g.]

A detailed ecological study, based on floristic analysis on E. Schmid's lines [cf. *For. Abstr.* 12 (No. 2750)], distinguishing and describing 7 main phytocoenoses. The author concludes that, on the calcareous mountain sites of the Jura, soil acidification caused by artificially introduced Spruce is not lasting, as one generation of Beech and Fir, if allowed to come up spontaneously, will restore the pH level of the soil.

3760. Richard, J.-L. L'épicéa à la limite de sa répartition naturelle dans le Jura suisse. **[Spruce at the limit of its natural range in the Swiss Jura.]** *Schweiz. Z. Forstw.* 107 (3), 1956 (153–64). 13 refs. [F.g.]

Describes the chief edaphic and vegetational features of the main occurrences of Spruce in the region, and stresses the need for phytosociological distinctions, down to sub-association and even facies level, as a basis for silvicultural decisions, particularly in selection forest. [Cf. *For. Abstr.* 13 (No. 1980).]

3761. Rivas Goday, S. Los grados de vegetación de la Península Ibérica (con sus especies indicadoras). **[Climax vegetation zones of the Iberian Peninsula (with their indicator species).]** *An. Inst. bot. A. J. Cavanilles* No. 13, 1954 (1955), (269–331). 21 refs. [Span.] O.B.D.

3762. Rivas Goday, S., *et al.* Aportaciones a la fitosociología hispánica. (Proyectos de comunidades hispánicas.) **[Contribution to the plant sociology of Spain. (Outline of the Spanish plant communities).]** *An. Inst. bot. A. J. Cavanilles* No. 13, 1954 (1955), (335–422 + 3 tbls.). 5 refs. [Span.] O.B.D.

The first part of a comprehensive ecological study of the vegetation of Spain, using the methods of Braun-Blanquet and Tüxen. The work will be continued in subsequent issues.

3763. Feinbrun, N., and Zohary, M. **A geobotanical survey of Transjordan.** *Bull. Res. Coun. Israel* 5*D* (1), 1955 (5–35). 28 refs.

Maps of rainfall, soil, phytogeography and vegetation (17 categories) are included. Transjordan comprises (*a*) the west-facing, rain-catching eastern slopes of the Jordan Rift, (*b*) a range of heights topping them (Gil'ad 1250; Edom 1650 m.), and (*c*) the plateau sloping gently east into the Syrian desert. The isohyets fall with the contours of (*b*) from 750 mm. on the heights to 100 mm. in the Jordan valley at −300 m. This range of rainfall is narrowly confined to the weather belt covering (*a*) and (*b*), the rest of the country getting generally < 100 mm. Mainly over (*b*), the Mediterranean-type flora carries a *Pinetum halepense*; a *Quercetum calliprini* with *Pistacia palaestina* and *Juniperus phoenicea* associations; a *Quercetum ithaburense*, and maquis associations. East of the north end of (*b*) is a *Pistacietum atlanticae* steppe forest. The other categories (discussed in detail) are mainly drier and desert types. Enclaves of arboreal Sudanean vegetation occur along the Jordan.

3764. Seth, S. K. **The principal grassland types and other grass habitats of Uttar Pradesh.** *Bull. U.P. For. Dep.* No. 24, 1954. pp. 28. 6 refs. Price *Annas* 11.

Contains 4 chapters: (1) general, (2) principal grassland types, (3) forests and other specialized habitats, and (4) annotated list of the common grasses of U.P.

3765. Qadri, S. M. A. **Ecological study of the riverain forest of Sind.** *Pakistan J. For.* 5 (4), 1955 (241–9). 5 refs.

These forests (ca. 480,000 acres) lie in the flood-land of the Indus, between protective embankments 12 to 25 miles apart. The changing course of the river, floods etc. are constantly causing erosion on the one hand and accretion on the other, $\frac{1}{15}$ of the area being affected in this way annually. The main species of the riverain forest are *Acacia arabica*, *Prosopis spicigera*, *Populus euphratica*, *Tamarix dioica* and *T. troupii*. Except for *P. spicigera*, which is a true xerophyte, these species cannot be grown in unirrigated areas outside the protective embankments, and this conversion of portions of an arid area (rainfall 3–9 in.) into tropical dry deciduous forest and tropical thorn forest is mainly due to the Indus and its annual floods. The natural succession on newly formed alluvium is described: it leads to sparse forest of ca. 75% *A. arabica* and *P. spicigera*, 23% *Tamarix* spp., and 2% Poplar. The forest is exploited mainly for charcoal and firewood. The possibility of improving these forests for the production of timber is discussed. The introduction of exotic species is not practicable.

3766. Jones, E. W. **Ecological studies on the rain forest in Southern Nigeria. IV. The plateau forest of the Okomu forest reserve.** *J. Ecol.* 43 (2), 1955 (564–94); 44 (1), 1956 (83–117). 54 refs.

The Cambridge Botanical Expedition to Nigeria, 1947–48 [cf. *For. Abstr.* 16 (No. 316)] studied the pattern of distribution of species, the regeneration, and the stability of rain forest, particularly in relation to the theory of 'mosaic' structure. The Okomu Forest Reserve, a compartment of which was studied by transects, lies on Benin sands and has a rainfall of 80–100 in.; it has been lightly exploited for at least 40 years. The plateau forest is a patchwork of the following serally related phases, which are more distinct physiognomically than floristically: (*a*) 'high forest', (*b*) 'broken high forest,' (*c*) and (*d*) 'tall' and 'low closed scrub', and (*e*) 'open scrub'. Scrub has been greatly extended by tree felling, but it is also formed by wind and is a normal component of unexploited forest. Of the 3 storeys, that of the emergents is best characterized floristically; 21% of its stems are very strong light-demanding species that are scarcely represented in the two lower storeys, 45% are species that are abundant in the lower storey but scarcely represented in the middle storey, and 32% are species that increase progressively in abundance from the emergent to the lower storey. There are striking variations in the abundance of particular species, even over a distance of a few km., and within the 200 ha. sampled by transects some species are found randomly distributed, others are patchily distributed on a large scale though randomly distributed on a small scale, and yet others are widely distributed but tend to occur in small patches etc. Very few pairs of species could be shown to tend to associate, as they should if floristically well defined communities were present. Thus, despite the existence of a mosaic of physiognomically distinct phases, and despite the patchy distribution of certain species, it was not possible to detect any well marked mosaic of species. Study of regeneration and age distribution suggests that regeneration and recruitment are discontinuous, and it is doubtful whether the existing regeneration of the emergent species is sufficiently numerous to reconstitute a forest as rich in emergents as that now existing. From archaeological evidence it seems probable that this land was farmed in relatively recent times but not less than 200 years ago, and it is in accordance with all the evidence to regard the forest as secondary forest of this age which is now breaking up. There are reasons for suspecting that no matter whether scrub is a normal phase in the progression or not, the forest of the true climatic climax might have few large trees, and perhaps fewer species and a simpler structure. *From author's summary.*

3767. Wild, H. **The principal phytogeographic elements of the Southern Rhodesian flora.** *Repr.* from *Proceedings and Transactions, Rhodesia Scientific Association* [*Bulawayo*] 44, 1956. pp. 12. 4 refs.

Distribution data from the Bikira, Fort Victoria, Belingue and Matopos district point to an east-west extension of the forest elements along the Eastern Border mountains. The main elements described are: the Cape element; a forest element following the same distribution but of tropical origin; an Afromontane element; a low-altitude forest element; and a deciduous woodland element (subdivided into acid and alkaline types).

3768. Westveld, M., *et al.* **Natural forest vegetation zones in New England.** *J. For.* 54 (5), 1956 (332–8). 11 refs.

Outlines the methods and principles used in preparing a vegetation map of New England, describes the forest vegetation zones established, and allocates S.A.F. forest cover types to them.

3769. BRAY, J. R. **The savanna vegetation of Wisconsin and an application of the concepts of order and complexity to the field of ecology.** *Abstr. of thesis* in *Dissert. Abstr.* 16 (2), 1956 (218). [University of Wisconsin.] O.R.S.

A plant-sociological study of the type, whose origin is traced back either to the destruction by fire of climax or intermediate moist-land forests, the degradation by fire of intermediate dry-land forests, or the invasion of the prairie by tree species, usually under the stimulus of grazing, dealing *inter alia* with the importance and dominance of major tree species and fertility gradients to adjoining vegetation types.

3770. WARE, G. H. **A phytosociological study of lowland hardwood forests in Southern Wisconsin.** *Abstr. of thesis* in *Dissert. Abstr.* 16 (2), 1956 (222–3). [University of Wisconsin.] O.R.S.

A study of the composition, range of variation, and ecological relationships of undisturbed natural forests, based on samples from 114 stands, dealing more particularly with the differences in swamps of fluvial and lacustrine origin. [Cf. *For. Abstr.* 14 (No. 1229).]

3771. HUECK, K. Plantas e formação organogênica das dunas no litoral paulista. Parte 1. (Contribuições para a pesquisa fitossociológica paulista 2.) **[The flora, and the formation and development of the São Paulo coastal dunes. Part 1. (Contribution to a study of the plant sociology of São Paulo 2).]** Instituto de Botânica, Secretaria da Agricultura do Estado de São Paulo, São Paulo. 1955. pp. 130. [Port.]

Notes on the plants of the coastal dunes (the *restinga*) of the state of São Paulo, their ecology and significance for dune fixation.

2. SILVICULTURE

See also Nos. 3690, 4302, 4346.

3772. DUGELAY, A. Considérations générales sur le traitement et l'aménagement de la forêt méditerranéenne en France. **[Silviculture and management of the Mediterranean forest in France.]** [*Docum.*] *5th Sess. FAO Jt. Subcomm. Medit. For. Probl., Nice 1956* No. *FAO/SCM/56-E*, 1956. pp. 13. [F.]

3773. GONZALEZ VAZQUEZ, E. Traitement et aménagement des forêts méditerranéennes en Espagne. **[Silviculture and management of Mediterranean forests in Spain.]** [*Docum.*] *5th Sess. FAO Jt. Subcomm. Medit. For. Probl., Nice 1956* No. *FAO/SCM/56-C*, 1956. pp. 8. [F.]

3774. VIDAL, P. **Silviculture and management in the forests of Morocco.** [*Docum.*] *5th Sess. FAO Jt. Subcomm. Medit. For. Probl., Nice 1956* No. *FAO/SCM/56-B*, 1956. pp. 8. [F.]

3775. GUTZWILLER, R. Principales pratiques sylvicoles en vue de la production de bois d'oeuvre en forêt dense équatoriale. **[The main silvicultural methods for the production of timber in dense equatorial forests.]** *Schweiz. Z. Forstw.* 107 (3), 1956 (175–94). 42 refs. [F.g.]

A critical description of the main management and regeneration methods developed or being tried in Belgian, British and French tropical West and Equatorial Africa in both high and secondary forests, such as the Belgian 'uniformisation par le haut', the British 'tropical shelterwood' and *taungya* systems, or the French 'amélioration des peuplements naturels'. [Cf. *For. Abstr.* 17 (Nos. 3786, 3927).]

3776. DONIS, C. La forêt dense congolaise et l'état actuel de sa sylviculture. **[Closed forest of the [Belgian] Congo and the present position of its silviculture.]** *Bull. agric. Congo belge* 47 (2), 1956 (261–320). 13 refs. [F.flem.e.g.] (Paper presented at the 4th World Forestry Congress at Dehra Dun 1954.)

After data on the area of these forests of the central basin, the peripheral galleries and Mayumbe (totalling 102,005,000 ha.), on the potential closed forest extension in the Guinea savannas (90,000,000 ha.), and on the montane and marsh forests, the general character of the rain forest is detailed under the heads of recent fallows, secondary forests of middle-aged trees, and old forests. The influence of man is discussed and the floristic composition tabulated for 9 representative regions. Examples are given of the timber production/ha. and of field-crop rotations in shifting cultivation. Succession and the successional status of timber species are discussed and a series of examples of silvicultural treatments described, with lists of species and growth rates and stand and regeneration tables. The general principles governing the silviculture of these forests and the consequent lines of action are set out in considerable detail. Silviculture is dependent on local factors and industrial development, and different treatment, with inevitably some sacrifice in advance fellings, must be given to forests already exploited, those to be exploited in 20–30 years, and those due for fellings in a more distant future. It is recommended, *inter alia*, that: (*a*) only fast-growing, well formed species should be used in diffuse line-planting, which should be confined to heavily exploited forest or fallow; (*b*) Anderson's spaced group-planting be adopted under selected cover for simple enrichment with timber species; (*c*) enrichment solely for timber be repeated on the same area at intervals corresponding with the felling cycle, so as to give good age distribution and simultaneous growth of tolerant and intolerant species; (*d*) where high volume production is required and thinnings are saleable, exotics or local species should be planted.

3777. MILLER, R. S. B., and HUGHES, E. **A cooperative experiment in forestry research.** *Pulp Paper Mag. Can.* 57 (5), 1956 (196 . . . 205). (*Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 1549 (*F*-2).)

Details the organization and some first results of experiments in the mixedwoods slope type (Spruces 32, Balsam Fir 29, Birch and Poplar 39%) of the Lakehead region (L. Superior). Harvesting for increased regeneration of the Spruces against hardwood competition is the chief aim. The industry, government, research bodies, and universities cooperate in this comprehensive and fundamental research.

3778. LOTTI, T. **Growing Loblolly Pine in the South Atlantic states.** *Fmrs'. Bull. U.S. Dep. Agric.* No. 2097, 1955. pp. 33.

Silviculture, protection, growth data, costs and volume tables for *Pinus taeda*.

3779. PAVARI, A. Il problema del castagno nei suoi attuali aspetti. **[The problem of *Castanea sativa* [in Italy] in its practical aspects.]** *Monti e Boschi* 7 (5), 1956 (195–211). [It.f.e.]

Discusses measures for dealing with the crisis of Chestnut-growing in Italy due to disease and economic change, e.g. conversion of orchards to coppice, breeding resistant strains etc.

3780. KOSSENAKIS, G. Le châtaignier en Grèce. **[The Chestnut in Greece.]** [*Pap.*] *3e Sess. Comm. int. Chât., Rome 1955* No. *FAO/CH/17D*, 1956. pp. 4. [F.] Limited distribution.

A note on its extension, distribution, optimum conditions, silvicultural treatment (mainly coppice), etc., giving tables showing stocking, and production from state and private forests. Owing to the need for careful individual tending, Chestnut coppice is most suitable for small holdings. It is planned to extend the area under Chestnut mainly by converting into pure stands the stands mixed with *Quercus coccifera*, *Arbutus* etc., and a beginning has already been made.

22. Silvicultural Systems. Constitution and Composition of Stands; Forms of Stand

221. High Forest Systems

See also Nos. 3592, 3720, 3723, 3728, 3797, 3802, 3807, 4049, 4258, 4347.

3781. SPURR, S. H. **German silvicultural systems.** *For. Sci.* 2 (1), 1956 (75–80). 5 refs.

Notes on the classification and distinguishing features of the clear-felling system, uniform, strip and irregular shelterwood, and selection system; the German terminology; and American equivalents.

3782. ANDERSEN, H. E. **Clearcutting as a silvicultural system in converting old forests to new in southeast Alaska.** *Proc. Soc. Amer. For. 1955*, 1956 (59–61). 10 refs.

Clear felling tears up the humus layers, exposes the mineral soil, and raises soil temperature, the combined effect being beneficial to seed germination and seedling development, as well as promoting decomposition of humus. This treatment also produces an increased proportion of Sitka Spruce in mixed Spruce/Hemlock stands.

3783. RAVE. Beitrag zur Erhöhung der Holzerzeugung. **[Increased wood production.]** *Forst- u. Holzw.* 11 (10), 1956 (201–4). 2 refs. [G.]

Discusses the advantages and limitations of natural or artificial regeneration under shelter for 40 years, and computes the increases in sizes of age classes and in m.a.i., as compared with existing yield tables based on clear felling, for rotations of 100 to 300 years, and site classes I to V, for Beech, Oak, Fir, Spruce and Pine.

3784. BRAATHE, P. Skjermstilling og dens betydning for foryngelsen. **[Shelterwood and its significance for regeneration.]** *Tidsskr. Skogbr.* 64 (1), 1956 (21–31). [Nor.]

Describes the uniform system, discusses its advantages in protecting seedlings against frost, heat, weeds, too rapid growth (reducing wood quality), and too high a water-table, and its possible disadvantages on raw humus and in cool climates, and makes recommendations for its application in Norway.

3785. CROKER, T. C., JR. **Can the shelterwood method successfully regenerate Longleaf Pine?** *J. For.* 54 (4), 1956 (258–60). 10 refs. [Southern Forest Experiment Station, U.S. Department of Agriculture.]

Discusses the accidental establishment of good stands of *P. palustris* in the Escambia Experimental Forest, Alabama, by the freeing of advance growth, which strongly suggests the adoption of the shelterwood system. This has advantages over the seed-tree method in the maintenance of the increment of the overwood, the better suppression of hardwoods and grass, and the shortening of the unproductive regeneration period which, under the seed-tree method, is protracted by the infrequency of seed years. [Cf. *For. Abstr.* 16 (Nos. 2837–8).]

3786. **[The tropical shelterwood system. Instruction 1/1953, revised to 1954.]** *Rep. For. Adm. west. Reg. Nigeria 1953/54*, 1955 (45–55).

The instructions cover the following 12 operations: *Year* 1—Demarcation; climber and weed-species cutting. *Year* 2—Pre-poisoning clearing; regeneration and pole count; seeding poisoning [poisoning to free or induce regeneration]. *Year* 2 *or* 4—Clearance poisoning of middle and lower storeys. *Year* 2, 3 *or* 4—Post-poison clearing of low growth. *Post-exploitation or post-clearance poisoning*—Freeing established saplings and poles. *Year* 6—Exploitation and repair of exploitation damage. *Post-exploitation*—Removal of shelterwood. *Any time*—Dibbling; line planting. [Cf. *For. Abstr.* 17 (Nos. 3775–6, 3927).]

3787. ZIEGLER, H. Der Plenterbetrieb in den Fichten-Reinbeständen des Hochgebirges. **[Selection system in high-level pure Spruce stands.]** *Allg. Forstztg.* 64 (3/4), 1953 (35–7). [G.]

Describes the application of this method in Vorarlberg forests between 1000 and 1700 m. alt., where it is traditional, and stresses the need for short felling cycles.

3788. **Selective versus clear cutting in Radiata Pine stands.** *N.Z. Timb. J.* 2 (6), 1956 (28–9).

Reports details of management of 320 acres planted in 1923, thinned 1935 and 1942 and harvested since 1950 by selection. Healthy and manageable regeneration is appearing and a small sawmill is continuously supplied. Planting at 200/acre, tractor cultivation, thinning at 20–25 years and pruning are recommended. Regeneration will appear when stems are reduced to 70/acre but will be too profuse and constitute a fire hazard at 50/acre in the high rainfall of the Nelson district. Fires invading the former type of regeneration do only sporadic damage and the larger logs produced fetch 2–3 times the price of smaller ones. [Cf. *For. Abstr.* 10 (No. 1820).]

3789. ISAAC, L. A. **Place of partial cutting in old-growth stands of the Douglas-Fir region.** *Res. Pap. Pacif. Nthwest. For. Range Exp. Sta.* No. 16, 1956. pp. 48. 9 refs.

In a study started in 1935 to measure the effect of partial cuttings, sample plots were established in stands 150–500 years old, representing a wide range of conditions; species composition ranged from pure Douglas Fir to heavy admixtures of associate species, and the amount felled from < 20 to $> 50\%$ of gross volume. Merchantable trees, usually Douglas, from the oldest and largest classes were felled. Mortality, especially by windfall, was high in the first, and often in the second, 5 years after felling. Felling and skidding caused considerable damage to the residual stand; the % of Douglas present was reduced and the species was sometimes completely eliminated. Few Douglas seedlings appeared, but seedlings of the more tolerant species (Western Hemlock, Grand Fir, Silver Fir and Western Red Cedar) were well established in many stands. In a few exceptional cases, satisfactory results were obtained, e.g. in a mature thrifty stand; on a watershed where high-value over-mature trees were removed in a light cut; and in a fog-belt area where removal of old scattered Douglas and Spruce plus a small % of a 75-year understorey of Hemlock and Spruce resulted in good growth and little loss. Generally, however, the results provide further proof of the accepted hypothesis that Douglas Fir is unsuited for a selection felling that continuously harvests the oldest trees in an all-aged forest.

222. Coppice, Pollarding and Lopping Systems

See also Nos. 3793, 4316, 4417.

3790. DUFLOT, E. Obtention de grumes de tranchage par la méthode du 'berceau'. **[Obtaining sawlogs by the 'cradle' method.]** *For. France* No. 66, 1956 (7). [F.] X.

Proposes a method of obtaining a good crop of standards [presumably Oak] by selecting suitable individuals at ca. 10 years, liberating them by cutting all vegetation, including coppice, to waist height for a radius of 4 m. round each selected tree, and preserving this 'cradle' by periodic cutting. The liberated tree has enough light to stimulate its growth, but not to encourage epicormics, and enough shelter to preserve it from wind damage etc.

3791. BURA, D. Prebirni način gospodarenja u niskim privatnim šumama crnike (*Quercus ilex*) na otoku Olibu. Gospodarska šuma i pašnjak. **[Coppice selection system in privately owned coppice forests of *Q. ilex* in the island of Olib. Forest and pastures.]** *Šum. List* 79 (5/6), 1955 (156–76). 6 refs. [Croat.croat.f.]

The period of rotation adopted in these coppice stands is 8 years; shoots are cut when 5 cm. in diam. at man-height [1·7 m.?]. The stand density is 50–70%, the stocking before felling 70–85 cu.m./ha., and the mean volume increment (including branches down to 1 cm. diam.) is 6–8 cu.m./ha. Only 30% of the wood can be used as timber, the remainder being firewood.

226. Changes of Silvicultural System. Conversion (by System or Species)

See also No. 4653.

3792. PĚNČÍK, J. Obrubná seč klínová s předsunutými kotlíky v přeměnách. **[Wedge fellings with outlying group fellings for the conversion of [Spruce] stands.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 28 (3), 1955 (407–16). 2 refs. [Cz.cz.russ.g.]

On the basis of past experience in Czechoslovakia, the author recommends, for the safe conversion of Spruce stands to mixed forest, clear felling on a dentate front, with separate group fellings as outliers so that successive extensions of the front merge with these outliers. Neither wedges nor groups widen during the whole process. The initial distance between wedge apex and group fellings should be not less than the mean tree height (h), and the length and base of each wedge 2 and $1–1\frac{1}{2} \times h$, respectively.

3793. MILLER, A. D. **An assessment of three methods of establishing Douglas Fir under tall Oak coppice in Quantock forest, Somerset.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/23/11, 1956. pp. 7.

Describes an experiment started in 1924 and 1926 to compare two ways of manipulating old Oak coppice (30–35 ft. high) before underplanting: (1) by clear cutting the coppice (no further tending), and (2) by girdling some 400/acre of the best developed Oak stems, followed 20 years later by a heavy cleaning of coppice. Treatment (1) was a failure, but (2) has given a satisfactory stand of Douglas Fir.

3794. BROWN, N. C. **Forest conversion.** *Wood* 21 (5), 1956 (186).

Outlines the policy of conversion to pure Southern Pine under general adoption by the 30 larger pulp and paper companies, each owning from a few hundred thousand to several million acres. These, cut over several times since the colonial period, and subsequently ravaged by fire, now consist of 5–100% hardwoods. The area, which stretches from Virginia along the Atlantic and Gulf coasts to Texas, is now being extended in places by swamp draining. These forests are logged, the cordwood cut out and the useless trees girdled. Brushwood is cut and laid mechanically, and then burned. One-year Southern

Pines are planted in winter, spaced 8 × 10 ft. (750/acre), which with 80% survival generally gives 600 at 24 years. Rotations vary with site from 24 to 40 years and height growth may be 23–30 ft. in 7 years. Costs/acre for one large company are cited at $10 each for clearing and for planting, the latter including plants at $2·50/1000. Present stumpage and cordwood values of the Pine and hardwood removed may well cover this. Yield at 300–600 bd. ft./acre/year is expected to be raised to 1000 bd. ft. by full stocking, fire protection and good management.

228. Constitution and Composition of Stands; Choice of Species and Form of Mixture; Tree Classes; Forms of Stand

See Nos. 3751, 3754, 3756, 3766, 4262, 4326–8, 4331, 4341, 4343, 4350.

23. Regeneration and Formation of Stands

See also Nos. 4313, 4425, 4653.

3795. Ferguson, E. R., and Stephenson, G. K. **Pine regeneration problems in East Texas: a project analysis.** *Occ. Pap. Sth. For. Exp. Sta.* No. 144, 1955. pp. 72 + ii. 300 refs.

After a brief survey of the forest types, soils and climates of the region (characterized by periodic droughts) the paper reviews the literature (chiefly American) on the problems of seed supply, initial establishment (sowing and planting) and seedling survival (for natural and artificial regeneration) of, primarily, Shortleaf and Loblolly Pine, and outlines the needs for further research. The paper is at once broader and more specific than *Agric. Monogr. U.S. Dep. Agric.* No. 18 [see *For. Abstr.* 16 (No. 1598)].

3796. Mork, E. Litt om sammenliknende forsøk med kultur og naturlig gjenvekst av gran på blåbærmark. **[Notes on comparative experiments with artificial and natural Spruce regeneration on bilberry sites.]** *Norsk Skogbr.* 2 (8), 1956 (263–8). [Nor.]

Tabulates and discusses results from data on height and % of blank 2 × 2-m. squares, on plots established 7–13 years before by natural regeneration, scarification and sowing, or planting, at sites in 6 districts, ranging in altitude from 180 to 600 m. These show that (1) planting reduces the rotation period by 3–9 years compared with scarification and sowing, and by 2–10 years compared with natural regeneration; (2) the difference in annual increment for sowing as compared with planting ranges from − 1·3 to + 0·2 cu.m./ha., and for natural regeneration compared with planting from − 2·5 to + 0·2 cu.m./ha. (the plus figures were from plots where the planted trees had suffered heavy mortality from grazing and insect attack, and where the % of blank squares was high). Some comparative costs for planting and natural regeneration on different sites are also given. It is concluded that, except on sites most suitable for natural regeneration, planting is to be preferred. [Cf. *For. Abstr.* 17 (No. 4313).]

3797. Brighten, C. W. **Regeneration of Scots Pine.** *J. Land Agents' Soc.* 55 (5), 1956 (189–92).

Describes methods being used successfully on about 1000 acres of the Bagshot Sands to regenerate Scots Pine (*a*) naturally, (*b*) by direct sowing. In the case of (*a*) the Pine stand is felled at 60–65 years for telegraph poles, leaving selected seed trees at 40/acre, and the area is then bulldozed with a 50-h.p. bulldozer to a depth twice that of the humus layer (cost £12/acre). The area is then harrowed and rolled, giving cultural conditions ensuring natural regeneration in the following spring. As soon as full stocking has been achieved, the seed trees are felled (in the 1st or 2nd year after seeding) with little or no damage to the seedling crop. Scrub areas that do not carry enough Scots Pine to assure natural regeneration are bulldozed with a heavy bulldozer, the scrub growth pushed into windrows and burnt, and the ash then bulldozed out and spread. Scots Pine seed is then broadcast at 1 lb./acre; it is dressed with Pb_3O_4 and mixed with softwood sawdust (1 lb. seed/600 lb. sawdust) to act as a carrier; sand should never be used as a carrier for Pine seed. After broadcasting, the area is lightly harrowed and rolled. Heather and bracken are the natural cover for young Pine seedlings and should not be discouraged or suppressed. Thinning is not done before the 10th year, when plants are thinned out to ca. 3 ft. apart. It has been found that naturally regenerated seedlings are not nearly so vulnerable to rabbits as nursery plants, and also grow faster (12–15 ft. high at 8 years compared with only 7 ft. for artificial regeneration 9 years after planting as 2 + 1 stock).

3798. Ilmurzyński, E., and Mierzejewski, W. Badanie wartości hodowlanej istniejących samosiewów sosny pospolitej. **[Investigation of the silvicultural merits of the existing self-sown *Pinus sylvestris* stands.]** *Sylwan* 100*A* (1), 1956 (75–84). [Pol.]

Poland has 31,226 ha. of self-sown Pine stands, 3–30 years old, of which 21,618 ha. are valuable stands, about half being still under a mother canopy. Small (0·02–0·06 ha.) trial plots of self-sown stands were selected in a wide scatter of forest divisions, and comparable trial plots started for artificial regeneration. Comparison of the age, height, d.b.h. and growth quality of stands naturally and artificially sown has shown that favourable conditions for natural regeneration of Pine exist in many Polish regions, and that many older self-sown stands are of better promise than the young artificial stands.

231. Natural Regeneration

See also Nos. 3575, 3721 *et seq.*, 3782 *et seq.*, 3795–8, 3931.

3799. Karpiński, J. J. Procesy regeneracji runa i samosiewu drzew pod okapem macierzystego drzewostanu na powierzchniach ze zdartym runem oraz z przekopana glebą w biotopach Białowieskiego Parku Narodowego. **[Processes of ground-cover regeneration and of self-sowing of trees under their own canopy, on areas stripped of ground cover and with loosened soil in the biotopes of the National Park of Białowieża.]** *Roczn. Nauk leśn.* No. 11, 1955 (3–76). 18 refs. [Pol.pol.russ.e.] (*Prace Inst. bad. Leśn.* No. 135.)

Studies were made on large numbers of 1-sq.-m. quadrats from 1947 to 1953 in 7 forest biotopes of the National Park in order to discover: (1) to what extent self-sowing on quadrats stripped of ground cover and with loosened soil will ensure satisfactory regeneration; (2) what differences occur in the composition of seedlings between quadrats so treated and those deprived only of cover, without soil loosening. Tables and histograms give: (*A*) for the ground-cover species: presence, frequency, basal cover, and constancy; (*B*) for tree seedlings: frequency, constancy-class distribution, number/ha., and age distribution.

3800. Duchaufour, P. Note sur l'influence du type d'humus sur la régénération des résineux. **[The influence of humus type on regeneration of conifers.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956*, No. *IUFRO*/56/21/2, 1956. pp. 6. [F.]

Discusses the various impediments to conifer regeneration presented respectively by mull and mor types, and concludes that the limiting factor is always water supply. This is inadequate on mull types because of the competition of ground vegetation, and on thick mor on account of physiological drought. Best conditions are found on a thin bed of mor, with a continuous moss cover preventing evaporation.

3801. Place, I. C. M. **The influence of seed-bed conditions on the regeneration of Spruce and Balsam Fir.** *Bull. For. Br. Can.* No. 117, 1955. pp. 87. 157 refs.

Between July 1948 and October 1952, a study was made of the influence of natural seedbeds on the germination and early growth of Red, White, and Black Spruce and of Balsam Fir in New Brunswick. In addition to a literature review, this paper gives accounts of investigations of: (1) root growth of wild seedlings in various seedbeds; (2) the influence of seedbed 'morphology' [essentially thickness of humus] on establishment of seedlings; (3) the effect of seedbed treatment on germination and growth; and (4) germination and growth of seedlings in transplanted seedbeds (i.e. samples of forest floor lifted intact out of their natural habitats and transferred to a uniform environment in the Acadia Station Nursery). Mention is also made of the results of other investigations already published; these include studies of (*a*) growth of seedlings in sandflats [cf. *For. Abstr.* 14 (No. 2028)]; (*b*) the influence of micro-relief on occurrence of seedlings [cf. *For. Abstr.* 14 (No. 2029)]; (*c*) origin of reproduction on Black Spruce swamps [cf. *For. Abstr.* 12 (No. 250)]; (*d*) the influence of bracken on establishment of seedlings [cf. *For. Abstr.* 14 (No. 3170)]; and (*e*) moisture regimes of various natural seedbeds [cf. *For. Abstr.* 12 (No. 65)]. The paper goes on to discuss, and draw tentative conclusions on, the silvics of Spruce and Fir seedlings, the characteristics of various natural seedbeds, and the implications of these experiments. *From author's summary.*

3802. **Factors affecting Black Spruce reproduction.** *Rep. Lake St. For. Exp. Sta. 1955* [1956] (55–6).

For all felling methods (clear-cut patches, clear-cut strips, shelterwood, group selection, tree selection, even-age light partial cut), the % of quadrats stocked with established Black Spruce seedlings, (1) increased as the proportion of the quadrat covered by a strip-road increased, (2) generally decreased as the proportion of slash increased, and (3) decreased markedly with an increase in the overstorey, although the % of quadrats stocked with seedlings of any species—primarily Black Spruce, Tamarack and Balsam Fir—decreased relatively little.

3803. **Grazing reduces fire damage to Pine seedlings.** *Rep. Sth. For. Exp. Sta. 1955* [1956] (40).

In a study on cut-over forest ranges in Central Louisiana, dominated by slender blue-stem grass, where the amount of dry grass on the ground averaged 2·5, 1·2, and 0·7 tons/acre on ungrazed, moderately grazed, and heavily grazed areas, 2-year Slash Pines, 1–2 ft. high, generally succumbed to experimental burnings (simulating either prescribed burning or wildfire) on all except the heavily grazed plots, whereas 3-year seedlings, 2–3 ft. high, suffered little damage on the moderately grazed plots.

3804. Gruschow, G. F. **Pond Pine regeneration on grazed switch cane ranges.** *Res. Note Stheast. For. Exp. Sta.* No. 90, 1956. pp. 2.

On 192 plots of $\frac{1}{200}$ acre, on a N. Carolina range partly stocked with *Pinus serotina*, only one new seedling was found in 2 years. Grazing did not seem to promote regeneration, but it adversely affected height growth and increased the mortality of the scattered natural regeneration that had sprung up after an earlier fire.

3805. Wenger, K. F. **Comments on 'Some treatment effects on Loblolly and Shortleaf Pine reproduction'.** *J. For.* 54 (3), 1956 (194–5). 2 refs.

Observations on the natural regeneration requirements of *P. taeda*, here detailed from the Bigwoods Experimental Forest in N. Carolina, show striking agreement with those made by W. H. Meyer for S.E. Arkansas, the opposite end of the species range [see *For. Abstr.* 17 (No. 2640)].

3806. Hansen, H. L. **White Pine regeneration during an eight year period following chemical brush release.** *Minn. For. Note* No. 51, 1956. pp. 2.

The application of a midsummer foliage spray of 5·6 lb. of an ethyl ester of 2,4-D in 100 gal. water per acre resulted in a complete top kill of Hazel brush under a natural White and Red Pine stand, a striking increase in White Pine [*Pinus strobus*] seedling establishment, and a release from brush competition that has been effective for 8 years.

3807. Crossley, D. I. **Mechanical scarification and strip clearcutting to induce Lodgepole Pine regeneration.** *Tech. Note For. Br. Can.* No. 34, 1956. pp. 14. 8 refs.

Experiments in scarifying clear-cut alternate strips in *P. contorta* stands indicate that satisfactory stocking can be obtained by this means alone. Scattering of cone-bearing slash as a supplementary seed source is unnecessary, and it is suggested that windrowing of slash to reduce fire hazard could be effected by mechanical means so as to scarify the soil at the same time.

3808. ELLIOT, G. **Natural regeneration of *Eucalyptus saligna*.** *Tech. Note For. Dep., Uganda* No. 2/56, [1956?]. pp. 2.

In the Namanve plantations [East Mengo] regeneration appeared after burning, and it was densest where the ash was thickest. Leaving seed-trees and burning the slash, resulted in regeneration mainly from seed of the trees removed. Broadcast sowing of selected seed on burned ground is recommended. In this way, sufficient plants for artificial regeneration could be made available with a great saving of cost (nursery transplants cost 75*s*./1000 or 20% of the whole planting and tending expenditure).

232. Artificial Regeneration

3809. OHMASA, M., *et al.* **Tree planting practices in temperate Asia: Japan.** *FAO For. Developm. Pap.* No. 10, 1956. pp. 156. 59 refs.

Covers collection, handling and treatment of seed, nurseries and nursery practice, planting methods, afforestation for erosion control [cf. *For. Abstr.* 17 (No. 1547)], and Japanese species used for afforestation.

3810. MCLEOD, J. W. **Plantations of the Acadia Forest Experiment Station.** *Tech. Note For. Br. Can.* No. 31, 1956. pp. 25. 6 refs.

The climate of the Maritime Provinces of Canada normally encourages natural regeneration, but there are now areas in need of planting or sowing. This note makes available information gained from over 60 small experimental plantations established since 1934 on acid, unfertile soils in New Brunswick, using native species from various seed sources and generally 2 + 2 stock.

3811. **[Nursery and planting-out problems.]** *Rep. E. Afr. Agric. For. Res. Organ. 1954/55* [1955] (65–80).

Notes on nursery practice, direct sowings, and planting-out experiments, mainly with Cypresses, Pines and Eucalypts at Maguga, near Nairobi.

3812. MOHANTY, A. P. **Progress of Teak plantation in Angul.** *Indian For.* 82 (4), 1956 (197–202). 5 refs.

Planting of Teak began in this division of Bihar and Orissa in 1886. Changes in planting method are described—the present method is to plant stumps at 8·5 × 8·5 ft. spacing, with 3 weedings in the first and 2 in the second year. Climber cutting is necessary for 20 years. Some growth data are given.

232.1. Choice and Trial of Species, Races etc.

3813. BIER, J. E. **International co-operation for the establishment of test plantings of important forest trees in several continents, with regard to resistance to diseases and pests.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/24/20, 1956. pp. 5.

Discusses the need for such test plantings, the difficulties involved, and the basic research needed to supplement them.

3814. HANSBROUGH, J. R. **International co-operation in forest tree disease research.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/24/21, 1956. pp. 7. [U.S. Forest Service, Division of Forest Disease Research.]

Discusses the problems to be solved and the possibilities of international co-operation in e.g. field surveys, test plantings, etc.

3815. PEACE, T. R. **International co-operation in the investigation of tree disease resistance and susceptibility.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/24/22, 1956. pp. 3. [Forest Research Station, Alice Holt.]

Discusses the problems involved in such co-operation, with reference to test plantings etc.

3816. TEMPLIN, E. Möglichkeiten einer internationalen Zusammenarbeit bei der Prüfung widerstandsfähiger Pappelklone gegen tierischen Schädlingsbefall. **[Possibilities of international co-operation in testing Poplar clones resistant to insect pests.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/24/17, 1956. pp. 4. [G.] [Institut fur Forstwissenschaften, Eberswalde.]

232.11. Species Trials (by Localities), including Forest Gardens, Trials of Exotics etc.

See also Nos. 3912, 3936, 4651.

3817. WILLIAMSON, J. Observaciones sobre árboles y arbustos de hojas caducas cultivados en la provincia Eva Perón. **[Deciduous trees and shrubs cultivated in Eva Perón province.]** *Rev. argent. Agron.* 22 (1–3), 1955 (17–39; 95–101; 141–53). [Span.] E.M.B.

The eastern part of the province forms a plain, almost entirely devoid of trees, vegetation being limited by lack of rain and low atmospheric humidity. Over the last 30 years, trials have been made with a large number of deciduous exotic species. These are listed by families, with notes on their progress and acclimatization.

3818. BARBOUR, W. R. Los páramos del Ecuador. **[The páramos of Ecuador.]** *Montes, Madrid* 12 (67), 1956 (5–6). [Span.]

The páramos cover roughly 2 million ha. of the Andean highlands in Ecuador. They consist mainly of treeless grassland with a few Ericaceous shrubs. Round the experimental sheep station on the Cotopaxi páramo (3600–3800 m. alt.). *Eucalyptus globulus* has failed, but *Pinus radiata* and *Cupressus* spp. have survived well. Dimensions of the trees 27 years after establishment are given, and suggestions made for other likely species to be tried in the páramos.

3819. MITCHELL, A. F. **The Western Larch.** *Quart. J. For.* 50 (2), 1956 (156–7).

Gives some data on d.b.h. and height growth of a number of individuals of *Larix occidentalis* in Great Britain.

3820. MERENDI, A. La Douglasia. [***Pseudotsuga taxifolia*.**] *Ital. agric.* 93 (2), 1956 (136–8). [It.] E.M.B.

Discusses the possibility of growing Douglas Fir in Italy (with photographs of some specimens grown at Vallombrosa).

3821. MÉTRO, A. Essai de plantation de quelques espèces d'*Eucalyptus* dans le midi de France. **[Experimental plantations of some Eucalypt species in the South of France.]** [*Docum.*] *2nd Sess. Working Party on Eucalypts, FAO Jt. Subcomm. Medit. For. Probl., Nice 1956* No. *FAO/SCM/EU/9-B*, 1956. pp. 21. [F.]

[Cf. *For. Abstr.* 13 (Nos. 2032, 3742); 16 (No. 364).] Includes notes on species being tested in trials conducted by the Fonds Forestier Français.

3822. BOULLEY, P. Essais en Corse d'une culture industrielle de l'*Eucalyptus*. **[Trials in growing Eucalypts on a commercial scale in Corsica.]** *Rev. for. franç.* 8 (5), 1956 (335–9 + 3 photos). [F.]

Successful trials have been made, using methods tested in Morocco, and some 200 ha. of maquis have been successfully planted with Eucalypts, mainly *E. globulus* and *E. rostrata*. The planting site is cleared by bulldozing, burning the uprooted shrubs, and disking. Seed is sown in pots in the nursery in April–May and plants are ready for planting out in the field in October. Planting is at 3 × 3 m. spacing, the seedling being removed from the pot only at the moment of planting. Cultivation with a disk-harrow twice a year for two years is desirable to keep down maquis regrowth. A 90% take is obtained and heights of up to 2 m. are attained in the first year. Costs are Fr. 10–15 per plant for nursery expenses; Fr. 30,000–40,000/ha. for site preparation; Fr. 200/linear metre for barbed-wire fencing (essential to keep off browsing cattle); Fr.30,000/ha. for planting; and Fr. 5000/ha. for subsequent cultivation. Plantations 2 years old survived the exceptionally cold winter of 1953–54, with temperatures of − 6° to − 8° C., but some damage was done to the plantations just made.

3823. THIRGOOD, J. V. **Progress reports of national working teams: Cyprus.** [*Docum.*] *2nd Sess. Working Party on Eucalypts, FAO Jt. Subcomm. Medit. For. Probl., Nice 1956* No. *FAO/SCM/EU/8-B*, 1956. pp. 8. 5 refs.

A brief summary of the activities of the Research Branch of the Cyprus Forest Department, on the choice, seed provenance, planting techniques etc., of Eucalypts.

3824. CLAUDOT, J. E. Recherches et expérimentation concernant l'*Eucalyptus* au Maroc. **[Research and experiment on Eucalypts in Morocco.]** [*Docum.*] *2nd Sess. Working Party on Eucalypts, FAO Jt. Subcomm. Medit. For. Probl., Nice 1956* No. *FAO/SCM/EU/9-A*, 1956. pp. 4. [F.]

A summary of work done at the Forest Experiment Station, Rabat.

3825. Rapports d'activité des équipes nationales: Tunisie. **[Reports on the activity of national working parties: Tunisia.]** [*Docum.*] *2nd Sess. Working Party on Eucalypts, FAO Jt. Subcomm. Medit. For. Probl., Nice 1956* No. *FAO/SCM/EU/8-A*, 1956. pp. 4. [F.]

A short account of current experimental plantations of Eucalypts.

3826. LACOURLY, G. Premières observations sur une tentative de boisement en climat aride. **[Preliminary report on an experiment in afforestation in an arid climate.]** [*Docum.*] *5th Sess. FAO Jt. Subcomm. Medit. For. Probl., Nice 1956* No. *FAO/SCM/58-A*, 1956. pp. 3. [F.]

Trial plantings of 2500 *Eucalyptus rostrata* and 500 *E. gomphocephala* were made in May, 1955, in a district of S. Tunisia with annual rainfall of 152 mm. occurring on 30 days, min. temperature of − 6° C. and max. + 53°, with an average of 25 days of frost, sandstorms in spring, and hot winds in summer. At the end of the first year *E. rostrata* had suffered 30%, and *E. gomphocephala* 20% mortality. Costs were ca. Fr.75/plant or Fr.30,000/ha.

3827. KHAN, M. I. -U. -R. **The genus *Eucalyptus*, its past and future in West Pakistan.** *Pakistan J. For.* 5 (4), 1955 (202–15 + 6 photos). 18 refs.

A short historical account of the introduction and trials of various Eucalypts, a summary of silvicultural requirements from 50 years' experiments, some growth data, notes on utilization including essential oils, and an annotated list of 60 species being raised from seed imported in 1954–55.

3828. HORNE, J. E. M., and WHOLEY, J. W. ***Cedrela mexicana*: 1929 taungya plantations, Sapoba.** *Inform. Bull. For. Dep. Nigeria* No. 24, 1955. pp. 4. 2 refs.

Gives data from sample trees measured in 1954 in 5 girth classes (2 ft. 10 in.–6 ft. 5 in.), and estimated volumes of remaining trees, trees to be removed, and total original stocking; with some notes on the tree and its wood.

3829. SUBRAMANIAM, B. A. **Teak plantations in the Andamans.** *Indian For.* 82 (4), 1956 (190–4).

Gives a short account of the history of these plantations (beginning in 1883) together with some growth data. Indications are that Teak will do well in the Andamans, and planting has recently been begun again.

3830. CHARDENON, J. Récentes introductions de peupliers des États-Unis en France. **[Poplars recently introduced from the U.S.A. to France.]** [*Pap.*] *8th Sess. int. Poplar Comm., Madrid 1955* No. *FAO/CIP/19-H*, 1955. pp. 2. [F.] Limited distribution.

Among the varieties mentioned as received and tested (*P. deltoides*, *P. fremontii*, *P. wislizenii*, *P. sargentii*, *P. trichocarpa* and *P. angustifolia*), southern provenances of *P. deltoides* appear most promising for French conditions, though many are not sufficiently frost-hardy.

3831. SZELESS, S. Versuche mit Pappeln im oberen Mürztal. **[Poplar trials in the Upper Mürz valley.]** *Allg. Forstztg.* 65 (1/2), 1954 (8–9). [G.]

Large transplants of × *Populus regenerata*, *P. nigra* (selection Dahlen), × *P. vernirubens*, × *P. robusta* and *P. caroliniana*, planted in small quantities along watercourses, on pastures etc., at altitudes between 600 and 1000 m., sometimes on very exposed sites, all did well during their first one or two growing seasons. *P. caroliniana* No. 48/T/108, in the first growing season, reached a mean height of 135·6 cm. against 115·3 cm. for No. 48/T/103. In nursery trials at 640 m. alt., mean heights of *P. simonii* dropped from 1st to 6th place from the first to the second growing season; *P. caroliniana* and × *P. marilandica* T/210 exchanged 2nd and 3rd place, × *P. marilandica* T/209 and *P. angulata* 4th and 5th. *P.* 'Wettstein × Drapal' was lowest both times. No insect pests were found on any of the trial material.

3832. GÜNZL, L. Ergebnisse der österreichischen Pappelsortenprüfung 1949–52. **[Results of Poplar variety tests in Austria, 1949–52.]** *Allg. Forstztg.* 65 (9/10), 1954 (125–31). 11 refs. [G.g.]

The paper presents a list of 85 clones, including 5 Stout-and-Schreiner hybrids and a number of Black Poplar clones, mostly hybrids of German and Austrian provenance, giving data as to rooting capacity, height growth, length of the growing season and branchiness, with notes on side-shade tolerance etc., on the basis of trials at Tulln experimental nurseries and also at Mariabrunn. Seasonal development is compared on the basis of height measurements of 1-year cuttings taken in mid-June, mid-August, and at the end of the growing season of each plant, and the resulting patterns for 2 consecutive years are related to the greatly differing distribution of rainfall for these periods. A diagram, showing relative height growth of 1-year cuttings and of 1-year cut-backs (on 2-year roots) is also presented.

232.12. Races and Provenance Trials

See also Nos. 3651, 3654–5, 3737, 3830, 3912, 4151.

3833. MORANDINI, R. Expériences internationales sur les races du mélèze (1944): notes sur les premiers résultats obtenus en Italie. **[The 1944 international Larch provenance trials: notes on the first results obtained in Italy.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/22/18, 1956. pp. 7. [F.] [Forest Experiment Station, Florence.]

Notes on the lay-out of the trials, and height growth, length of annual shoot, diameter growth, branchiness, stem form, cone bearing, and persistence of needles.

3834. KLEM, G. G. Dyrkingsverdien av norsk og mellomeuropeisk gran. **[Cultivation value of Norway Spruce of Norwegian and Central European provenance.]** *Norsk Skogbr.* 2 (6), 1956 (181). [Nor.]

Reports briefly on experiments by the Norske Skogforsøksvesen in co-operation with Det Danske Skovforsøgsvæsen and the Papirindustriens Forskningsinstitutt. Results indicate that Spruce of German provenance in Norway and Denmark has a high increment per unit area, is no branchier than Spruce of Norwegian provenance, and yields ca. 8% more dry substance for the same annual ring width. Five cu.m. of Norwegian Spruce or 4·6 cu.m. of German Spruce were needed to yield 1 ton of sulphite pulp. Certain pulp qualities were a little better from Norwegian than from German material but not sufficiently so to outweigh the advantages of greater yield from the latter.

3835. LINES, R. **Provenance experiments.** *Rep. For. Res. For. Comm., Lond. 1954/55*, 1956 (35–6).

Notes are given on provenance trials of Lodgepole Pine, Sitka Spruce, and Douglas Fir. The appearance of the disease *Rhabdocline pseudotsugae* on some coastal strains of Douglas Fir, hitherto believed to be immune, will necessitate a re-assessment of the position as regards this disease.

3836. **Loblolly Pine seed source studied in co-operation with TVA.** *Rep. Sth. For. Exp. Sta. 1954* [1955] (7).

Heights and survival rates from seed of 8 different provenances, 5 years after planting at 3 research centres, generally decreased with increased distance between seed source and planting site.

3837. HEJTMÁNEK, J. Výsledky provenienčního pokusu se slavonským dubem v polesí Vacíkov na Rožmitálsku. **[Results of provenance trials with Slavonian Oak in the Vacikov forest district near Rozmitál.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 28 (3), 1955 (433–42). 32 refs. [Cz.cz.russ.g.]

Trials, which began with side-by-side plantings in 1923, show that despite lower temperature limits and less favourable soil conditions, the Slavonian Oak (from sites W. of Zagreb) has preserved most of its valuable characteristics. Compared with the indigenous Czechoslovakian Oak, it has thinner and straighter branches, a more regular crown, and a straighter and more cylindrical bole. It also has a better height increment, although diameter increment is lower, probably owing to stand density. It has preserved its late-flowering habit (3 weeks later than the indigenous strain) and at 33 years of age its natural mortality is only 16·8% as compared with > 57%.

232.13. Trials of Hybrids and Other Products of Tree Breeding

See section 165 and Nos. 3813–6, 3831–2.

232.2. Preparatory Work, Auxiliary Measures

See also Nos. 3822, 3904, 3911, 3914, 4083.

3838. **[Effect of site preparation on the establishment of Pines.]** *Rep. Sth. For. Exp. Sta. 1955* [1956] (17–20).

(1) Loblolly Pine sown on Louisiana slender blue-stem range sites prepared by disking, burning, or both, established itself best on burned plots, but survival after 3 years was satisfactory only on disked sites, stratified seed giving somewhat better results. (2) For Longleaf, too, first-year survival and growth was shown to be best on fresh burns, and better on 1-year roughs than older ones. Follow-up treatment was necessary for continued rapid growth and brown-spot control (3) Burning the site 3 times in succession before planting reduced brown-spot infection.

3839. Universal-Forstbodenfräse 'Pionier'. **[The 'Pioneer' universal forest rotary cultivator.]** *Allg. Forstztg.* 65 (5/6), 1954 (79–80). [G.]

The machine, of German manufacture, weighs 625 kg. It is fitted with independent knife disks on strong springs, and is thus suitable for sites with large stones and surface roots. It works well on *Vaccinium*-covered ground, and also in the nursery. The machine, fitted with a 9-h.p. petrol or diesel engine, can be converted into a plough, used to drive a hole-digger, or to draw a trailer. Road speed is up to 15 km./hour.

3840. RUDNICKI, J. W. Wpływ przygotowania gleby na udatność upraw oraz wzrost młodników. **[Effect of soil preparation on the quality of plantations and growth of young stands.]** *Sylwan* 98 (4), 1954 (309–16). [Pol.]

Presents tabulated results of yearly observations on the heights of *Pinus sylvestris* plants aged 1–6 years and the % mortality of these plants when the soil was prepared as follows: (1) ploughed furrow with soil loosening, (2) ploughed furrow without soil loosening, (3) soil loosening in strips without removing the sod, (4) full ploughing, (5) ridge ploughing, and (6) controls without soil preparation. The statistical analysis of the data points to a significant correlation between the method of soil preparation and the height and survival of Pine plants. The same conclusion is drawn for the height and diameter of young stands in relation to several methods of soil preparation.

232.3. Seed, Nursery Practice, Direct Sowing

232.31. Seed

See also Nos. 3795, 3809.

232.311. Seed Production (Seed Years, Seed Crops; Seed Orchards and Methods of Inducing Seed Production)

See also Nos. 3641, 3723, 3857, 3987, 4200–1.

3841. MATTHEWS, J. D. **The survey of seed sources and plus trees in Britain.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/22/8, 1956. pp. 10.

Reviews progress made and gives tabulated data on: (1) number and area of registered seed sources in Scotland, (2) total number of plus trees registered in Britain and samples from the registers of seed sources and plus trees.

3842. RUFFER, H., and HIERONYMUS, H. Zuchtbaumauswahl. **[Selecting trees for seed.]** *Wald* 3 (10), 1953 (296–302). [G.]

Discusses the criteria for a preliminary selection of élite trees for further propagation, dealing in greater detail with local races of Pine in the Leipzig region, and their site requirements.

3843. MORANDINI, R. Il controllo dell'origine dei semi forestali in Italia. **[The control of forest tree seed sources in Italy.]** *Monti e Boschi* 7 (3), 1956 (114–22). [It.f.e.]

The selection and classification of élite stands of coniferous species for seed collection began in 1949 and was completed in 3 years. The author explains the methods and criteria adopted. By the end of 1955 there were 69 registered seed stands totalling 14,476 ha. These will now need careful thinning, and rules for seed collection are to be laid down. [Cf. *For. Abstr.* 17 (No. 3852).]

3844. HAGMAN, M. **Racial inventory of forests in Finland and the use of material in forest tree improvement.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/22/20, 1956. pp. 9. [E.f.g.]

Describes the methods used in selecting plus trees and plus stands and the use of the selected material in breeding.

3845. SØEGAARD, B. **Selection of stands and single trees for seed production and breeding by means of general inventory in Denmark.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/22/19, 1956. pp. 3.

From 1 to 28 stands for each of 34 native and exotic species had been chosen by the board of the Danish Forestry Society by 1953. Seed orchards established include Larch, Ash, Beech, Grey Alder and *Thuja plicata*.

3846. MITCHELL, A. F. **The selection of 'plus' European Larch trees.** *Scot. For.* 10 (2), 1956 (68–80). 4 refs.

Discusses the criteria for selecting 'plus' trees, gives age and dimensions of some of the best plus trees in Britain, and concludes that the upper limits of height and g.b.h. growth for Larch in Britain are 145 ft. and 18 ft. respectively.

3847. LANGNER, W. Förderung von Zuchtbaumselektionen in den natürlichen Verbreitungsgebieten forstlich bedeutungsvoller Holzarten. **[The promotion of the selection, within the natural range of species important for forestry, of trees to supply material for breeding.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/22/6, 1956. pp. 3. [G.]

Discusses the need for initiating and financing co-operative programmes for selecting parent trees representing a cross-section of the whole range of variation in natural populations of important species, from which, by vegetative propagation, centralized collections of living material might be built up for the supply of scions to tree breeders. Even extreme ecotypic variants, e.g. of poor growth and form but good frost-hardiness, are needed by breeders attempting to combine desirable characters. Selection of parent trees by breeders should preferably go hand-in-hand with selection of seed-bearing stands by specialists in provenance research. A brief note is included on a beginning made by the Schmalenbeck Institute of Forest Genetics and Breeding, which has a collection of European Larch grafts derived from the Bavarian and Austrian Alps, to be supplemented later by material from other European countries and also material of Japanese Larch from its natural range.

3848. **Fertilizer may increase cone crop of Pines.** *Rep. Calif. For. Range Exp. Sta. 1955* [1956] (13–4).

In spring 1951 and again in 1952 and 1953, 8 paired Sugar Pines [*P. lambertiana*], of diameters ranging from 27 to 52 in., were treated with 100 lb.

NH_4 phosphate per tree, applied over an area equal to the crown width. None of the trees bore cones in 1951; in 1952, 4 treated (*t*) trees bore more and 4 bore fewer cones than their untreated (*u*) counterparts; and in 1953, *t* trees bore nearly twice as many cones as *u* trees. Total cone production of *t* trees for 1953–55 was 3 times that of *u* trees; the difference was particularly striking in 1955 when only one of the *u* trees bore a single cone, but 5 of the *t* trees produced a total of 162 cones.

3849. **Longleaf cone production stimulated by 'ringing'.** *Rep. Sth. For. Exp. Sta. 1955* [1956] (21).

When two slightly overlapping half-circles were cut through the cambium a little above stump height, ca. 4 in. apart, on opposite sides of Longleaf Pines of 10–12 in. d.b.h., average cone production after 3 years was more than doubled. Strangulation with tight metal bands did not stimulate cone production on Slash Pine up to 10 in., or Longleaf up to 12 in., nor did inoculation with 0·2% 2,4-D.

232.312. Seed Collection, Extraction and Grading (including Seed Weight)

See also Nos. 3722, 3726–7.

3850. Cram, W. H. **1955 report on shelterbelt tree breeding.** Forest Nursery Station, Indian Head, Sask. [1956]. pp. 7.

Experiments indicate that *Picea glauca* and *P. pungens* cones should be harvested when the m.c. falls below 50% and/or sp. gr. falls below 0·96. A practical test is to see whether cones float in linseed oil, which has a sp. gr. of 0·94. Studies of *P. pungens* indicate that individual trees differ with respect to self-compatibility. Self-set varied from 0 to 18% of open set.

3851. Cram, W. H. **Maturity of Colorado Spruce cones.** *For. Sci.* 2 (1), 1956 (26–30). 7 refs. [Forest Nursery Station, Indian Head, Saskatchewan.]

To determine the stage at which cones of *Picea pungens* should be harvested, samples were taken at weekly intervals through September from a blue- and from a green-needled form, the dates of natural seed dispersal being 30 Sept. and 3 Oct. respectively. The sp. gr., moisture content, seed and seedlings obtained per cone, so gathered, and the germinative capacity are tabulated. The mean number of sound seeds per cone increased from 39 to 90, the latter being reached 1–3 days before dispersal. Commercial seed harvest should begin when 90% of cones float in linseed oil; for maximum harvest, when 100% float in turpentine. Other correlations e.g. with dormancy (which requires investigation) are discussed.

232.314. Seed Purchase, Trade and Transport

3852. Morandini, R. Le contrôle de l'origine des semences forestières en Italie. **[The control of forest tree seed origin in Italy.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/22/17, 1956. pp. 6. [F.]

Cf. *For. Abstr.* 17 (No. 3843).

232.315. Seed Storage and Treatment

See also Nos. 3857, 3877, 3896, 3898, 4253, 4370.

3853. Holmes, G. D., and Buszewicz, G. **Longevity of acorns with several storage methods.** *Rep. For. Res. For. Comm., Lond., 1954/55*, 1956 (88–94 + 3 photos). 13 refs.

In a study of 13 methods of storage of acorns of *Quercus robur* begun in 1950, all acorns were dead in 12 months except in 3 methods in which a constant temperature of 36° F. had been maintained. The moisture content of the acorns was critical, and had to be kept between 40 and 45%. Sealed containers, in which CO_2 concentration became high, caused early death of the seeds. The best method was to use sound seed having a m.c. of 40–45% of fresh weight, and stratify it in dry peat or sand in a closed but unsealed container at a constant temperature of 36° F. In these conditions, a drop of only 20% in the germinative capacity occurred after 36 months, and 52% were still alive after 42 months.

3854. Jahnel, H. Beiträge zum Stratifizieren von Forstsaatgut. I. **[The stratification of forest seed.]** *Angew. Bot.* 29 (4/5), 1955 (139–51). 10 refs. [G.g.] E.M.B.

Reports experiments with seed of *Acer pseudoplatanus*. Highest germination % and speediest germination were obtained from stratification at 1° C. for 12 weeks. For germination after stratification the best temperature was 10°–15° C. Stored seed seems to lose its viability if moisture content falls below ca. 15%.

3855. Příhoda, A. Poškození habrového semene při stratifikaci. **[Damage sustained by *Carpinus betulus* seed during stratification.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 28 (3), 1955 (385–92). 5 refs. [Cz.cz.russ.e.]

Stratification in 1954 of Hornbeam fruit gathered in 1953 showed that > 50% were damaged by *Verticillium* spp. when the sand was kept moist. Some of the infection occurs on the tree.

232.318. Seed Testing. Germination Tests. Seed Quality

See also No. 3727.

3856. Hilf, R., and Rohmeder, E. Untersuchungen über das Verhalten von Tetrazoliumchlorid bei der Keimfähigkeitsprüfung forstlicher Sämereien. **[The effects of tetrazolium chloride in germination tests of forest seed.]** *Forstwiss. Cbl.* 74 (9/10), 1955 (279–92). 31 refs. [G.g.]

Tetrazolium chloride (TTC) penetrates into seeds by a process of diffusion, and is reduced at different rates, according to the reducing power of the individual tissues. To obtain satisfactory staining, therefore, all obstacles to diffusion must be eliminated. The meristem, vessels, epidermis and wounded areas react quickly, the parenchyma cells, embryo and endosperm more slowly. These differences are still noticeable even after extremely long periods of staining. Since the formazans are soluble in fats, they are to be found in the cells either in a dissolved or non-dissolved form, according to the fat content of the cells. Because of their solubility in fat, the formazans can spread over wider distances than the width of a single cell. An exact pin-pointing of the place within the cell where the reducing process takes place is therefore very difficult. Quantitative measurements of the amount of formazans taken up by the cells show that the increase of formazans in the cells is at first relatively quick, but later slows up. The final capacity of the cell is not reached even after staining for 120 hours. Germination tests of Robinia after treatment for 1 hour with 0·02% TTC showed a slight promotion of root growth. The use of higher concentrations (0·05–0·5% for 1 hour) markedly inhibited growth in both Robinia and *Pinus nigra*.

3857. HOLMES, G. D., and BUSZEWICZ, G. **Forest tree seed investigations**. *Rep. For. Res. For. Comm., Lond. 1954/55*, 1956 (13–6).

In interpreting tetrazolium vital-staining tests, it is now found that misleading results may occasionally be obtained if attention is not paid to the staining of the endosperm, since a seed with a fully live embryo may still not be viable if the endosperm is defective. Further tests on slow-germinating species such as Ash and Lime confirmed that the endosperm here has an inhibiting effect, since quick germination of excised embryos was obtained.

There is need of a simple and reliable technique to enable field foresters to assess the likely yield of sound seeds from cones before large-scale collections are made. Work is in progress to test the accuracy of a method based on examination of the cut surface of sample cones. A special tool has been developed for obtaining accurate radial longitudinal sections through cones.

Seed storage tests were continued. Conifer seeds can be stored for 4 years with little drop in germinative capacity provided they are dried to the right m.c. (< 10%) and kept in sealed containers at 36° F.

3858. THIRGOOD, J. V. **A note on the testing of *Eucalyptus* seed**. *Emp. For. Rev.* 35 (1), 1956 88–9). 3 refs.

The small size of the seed of *Eucalyptus* spp., the very variable germinative capacity, and the high level of impurities which usually has to be accepted, can lead to great difficulties in purity analysis and viability tests. A testing method based on that used at Nancy [cf. *For. Abstr.* 16 (No. 1476)] has been developed in Cyprus to give a measure of the germination capacity of the uncleaned seed. A working sample of 1 g. is employed, great care being taken that it is truly representative of the material sent in for analysis, and it is divided into 3 sub-samples. A standard closed germination cabinet is used and the B.P. (between paper) test method is employed, in which each sub-sample is folded between absorbent paper. Germination occurs after the third day and proceeds very rapidly. Examination of the germination curves of a series of tests on seed of 43 species of Eucalypt, showed a remarkably uniform pattern of germination; in all except 9 seed lots of low germinative capacity, the bulk (80–100%) of the viable seed germinated within 16 days, and in 71% of the tests a germination figure of more than 70% of total germination was obtained in the first 12 days. Germination per g. of uncleaned seed was found to vary between 1 and 900 seeds germinated. It is recognized that in this method of seed testing much grosser techniques are employed than those prescribed in the International Rules, but it is considered that, for the special conditions of Eucalypt seed, and in view of the poor facilities often available for the testing of this species, this provides a practical method of obtaining a measure of the viability of the individual seed lot.

232.32. Plant Rearing. Nursery Practice

See also Nos. 3809, 3811, 3822.

3859. MOLITOR, G. L'établissement et la conduite des pépinières de propagande au Congo Belge. **[The establishment and management of forest nurseries in the Belgian Congo.]** Direction de l'Agriculture, des Forêts et de l'Élevage, Ministre des Colonies, Brussels. 1955. pp. 85. 14 refs. [F.] Price *Fr.*25.

A manual designed particularly for members of the civil service attached to missions for the instruction of the native population in forestry, agriculture etc. All aspects of nursery practice are covered.

3860. FAULKNER, R., and ALDHOUS, J. R. **Nursery investigations**. *Rep. For. Res. For. Comm., Lond. 1954/55*, 1956 (16–32 + 2 photos).

[Cf. *For. Abstr.* 17 (No. 1491).] *Partial sterilization of seedbeds*: Trials were made in 17 nurseries throughout the country, chloropicrin being tested as well as formalin. In all but two nurseries, significant increases in height growth of seedlings were obtained, chloropicrin (at 30 gal./acre) giving results as good as formalin or better. Responses were greater on ground that had been repeatedly cropped than on fallow. Chloropicrin caused a reduction in the number of seedlings in several cases, which is attributed to the seed being sown before all traces of the sterilant had left the ground. It appears that, in most cases, at least a month should elapse between injecting chloropicrin at 30 gal./acre and sowing the seed. *Irrigation by overhead spraying*: Irrigation of seedbeds by overhead spray line at Kennington nursery near Oxford again gave improved growth and stocking in the most frequently irrigated plots, in spite of a generally wet season (though there was a partial drought in April and early May). After 5 years, the pH had increased from 5·2 in the control plots to 6·0–6·2 in the irrigated plots, apparently owing to the lime content of the irrigation water. *Undercutting seedbeds*: Experiments were continued, the range of species being extended to include Oak and Beech [cf. *For. Abstr.* 16 (No. 1652)]. Indications are that the best plants as regards root and shoot weight are obtained from thinly sown beds, undercut at a depth of 2–4 in. either in August of the first year or March/April of the 2nd year. Put out as 'one-undercut-ones' in the forest, their performance is generally intermediate between that of 1 + 1 transplants and that of 2nd-year seedlings. *Weed control in seedbeds*: Pre-emergence spraying with mineral oils was extended to a number of conifer species, but poor germination precluded reliable assessments of the effect of the oils on tree species, except that it was clear that the heaviest application of vaporizing oil (120 gal./acre) reduced seedling numbers of Japanese Larch. Trials with pre-emergence applications of pentachlorophenol (PCP) and isopropylphenylcarbamate (IPC) reduced seedling numbers; PCP gave only a slight, but IPC a significant, degree of weed control. 'User trials' of post-emergence applications of mineral oils on a large scale, on a wider range of sites, climates, and species, gave in general good weed control, but vaporizing oil and the heavier applications of white spirit caused some damage to Japanese Larch, Douglas Fir, and Sitka Spruce seedlings; Corsican Pine was not affected. In transplant lines, inter-row spraying with vaporizing oil and with white spirit caused no damage to the crop even at levels of application up to 120 gal./acre, and at Bramshill such spraying gave very good weed control; over-all sprays caused significant reduction in growth, with scorching of foliage and death of leaders, in Japanese Larch, Douglas Fir, and Sitka Spruce. Non-selective weedkillers such as Na trichloroacetate, chlorophenyldimethylurea (CMU), $NaClO_3$, and 2,4-D in a range of strengths were tested for weed control in fallow areas in the previous year. Residual effects in the year under review were negligible except in the case of CMU; conifer crops, with the notable exception of Douglas Fir, suffered badly on ground treated with this chemical in the previous season. *Control of weeds by electricity*: A portable apparatus, developed by the Electrical Research Association for thinning sugar beet, was tested on weeds prevalent in nurseries. It became apparent that, while small weeds were killed instantaneously, these same weeds would have been killed instantaneously by the application of mineral-oil weedkillers. Larger weeds were not necessarily killed unless an appreciable time was spent in touching all sides of a plant, an operation which would take longer than careful removal by hand. *Seedbed covering media for* Abies grandis: Preliminary indications are that this species likes deep (¾-in) covering, and is equally happy with a soil or grit cover. *Soil conditioners*: The areas of seedbed on a heavy soil at St. Asaph, which in 1952 and 1953 were treated with 'Krilium' soil conditioner, were resown in 1954 without further treatment. At the end of the growing season there was a significant reduction in numbers of seedlings of Scots Pine and Sitka Spruce on plots treated with Krilium (45% in the case of Scots Pine) compared with controls. There was no significant effect on seedling numbers of Japanese Larch, Norway Spruce or Douglas Fir, and none on height growth of any species. The soil itself, when treated with 'Krilium', showed a marked increase in crumb formation and workability.

232.322. Preparation and Treatment of Soil, including Maintenance of Fertility

See also Nos. 3839, 3860, 3875.

3861. RICHARD, F. Über die künstliche Strukturverbesserung von Ton- und Staubböden. **[On the artificial improvement of the structure of clay and silt soils.]** *Schweiz. Z. Forstw.* 107 (4), 1956 (249–66). 10 refs. [G.g.f.]

Presents tables and graphs on the effect of Krilium in various concentrations on the structure (% of aggregates 0·25–6 mm. in diameter) of 4 Swiss soils, with a description of the experimental methods used. On two neutral silt-loams the effect was good, but on an acid silt-loam tending to compaction it was poor, and on an acid sandy loam (from an afforestation trial) it was almost nil. Acidification of neutral samples decreased, and neutralization of acid samples increased the effect. Costs limit its application.

3862. **Soil texture is important in nurseries.** *Rep. Stheast. For. Exp. Sta. 1955*, 1956 (2).

One-year planting results with 1 + 0 Longleaf Pine in artificial soil profiles of different textures showed that it is possible to regulate the number and position of lateral roots. A nearly pure sandy profile gave an average of 13·6 lateral roots at 7 in. depth against only 3·6 in sandy clay.

3863. FAULKNER, R. **Comparison of Shell 'D.D.' with formalin as a conifer seedbed partial soil steriliser.** *Rep. For. Res. For. Comm., Lond. 1954/55*, 1956 (94–101). 4 refs.

Shell D.D. (dichloropropane-dichloropropylene) was found to have some sterilizing action on nursery soils, but less than formalin, though it was easier to apply. It was not consistent in its weed-killing properties, and proved generally inferior to formalin in this respect. Detailed experimental data are given.

3864. FAULKNER, R. **Green crops compared with hopwaste as heathland nursery treatments.** *Res. Br. Pap. For. Comm., Lond.* No. 19, 1956. pp. 10.

The experiments described, all carried out with Sitka Spruce in 1949, 1951 and 1952, showed that, in the first year on new heathland or woodland nursery sites, the main limiting factors to seedling growth are lack of N, P, and K. They also showed that a first-year green crop of oats, grown with the aid of artificial fertilizers and followed by seedbed dressings of NPK fertilizers at standard rates, can provide a stimulus to Sitka Spruce seedlings equal to, and more consistent than, that provided by compost followed by similar rates of NPK fertilizer. The cost of growing a green crop and ploughing it in is about one-sixth of the cost of a normal dressing of 10 lb. bracken/hopwaste compost per sq. yd. There was, however, little residual benefit from the green crop in the second year, and it is therefore unlikely to become a substitute for compost. [Cf. *For. Abstr.* 15 (Nos. 1287–8).]

3865. **Nursery fertilizers affect planting survival.** *Rep. Stheast. For. Exp. Sta. 1955*, 1956 (3–4).

Type of fertilizer and, rate, time, and frequency of application affected the survival rate of transplanted Slash Pine seedlings.

3866. HUTT, P. A. **The Dunemann nursery system.** *Quart. J. For.* 50 (2), 1956 (155–6).

Notes, with costs, on the use of this system [cf. *For. Abstr.* 14 (No. 1151)] to raise planting stock for a private estate in Shropshire. Little, if any, weeding is required and costs compare favourably with normal methods; one-year seedlings of all species are good, with very fine roots, and transplant well. Notes are given on Oak, Beech, Spanish Chestnut, Larch, Douglas Fir, Norway Spruce, *Abies grandis* and *A. nobilis*, Scots and Corsican Pine, *Thuja plicata* and *Tsuga heterophylla*.

232.323. Sowing and Covering

See also Nos. 3860, 3872, 3875.

3867. HERRAN, K. Eine Säemaschine für Forstsamen. **[A sowing machine for forest seed.]** *Allg. Forstztg.* 64 (5/6), 1953 (73). [G.]

The machine, intended for nursery use, consists of a hand-drawn roller, 24 × 110 cm., fitted with 13 rings 1 cm. high and 2·5 cm. wide, for making the drills, and a distributor with 13 feed pipes having an adjustable regulating mechanism operating when the roller is in motion. Each feed pipe can be disconnected separately, as drill spacing requires.

232.324. Transplanting and Lining Out, including Grading of Seedlings

3868. CLIFFORD, E. D. **Use of a potato digger for lifting nursery stock.** *Tree Plant. Notes* No. 24, 1956 (9–10). [Chittenden Nursery, U.S.F.S. Wellston, Mich.]

A 2-row potato digger [not described or illustrated] made a good job of lifting 2 + 0, or 3 + 0 and 2 + 2 Red Pine stock, which are normally difficult to lift owing to their heavy interlaced roots. The digger shakes much of the soil from the roots, and the rest falls off with a shake or two. 2 + 1 stock, however, did not handle well.

3869. STONE, E. C., and SCHUBERT, G. H. **New roots on Ponderosa Pine seedlings.** *California Agriculture, Berkeley, Calif.* 10 (3), 1956 (11, 14).

Experiments in 1953 and 1955 showed that 1 + 1 seedlings lifted in autumn, root-pruned and grown in crocks filled with sand or perlite (sponge rock) and watered with nutrient solution, showed much poorer root growth than those lifted in spring and given the same treatment.

232.325. Tending (in both Seedbeds and Transplant Beds)

See Nos. 3860, 3863.

232.326. Salvage of Overgrown Seedlings and Transplants. Root Pruning etc.

See also No. 3860.

3870. CLIFFORD, E. D. **Seedbed root pruner.** *Tree Plant. Notes* No. 24, 1956 (11–2). [Chittenden Nursery, U.S.F.S. Wellston, Mich.]

The machine consists of a series of rolling coulters mounted on an axle and spaced so as to fit between the rows of plants. The coulters are 18 in. in diameter and permit pruning of the roots to a depth of 5–6 in. The axle is suspended on a frame so that it can be raised or lowered by the hydraulic lift on a tractor.

232.327. Protection Measures in Nurseries

See also Nos. 4085–6, 4144, 4255.

3871. PŘÍHODA, A. Nebezpečna choroba modřínů. **[A dangerous disease of Larch trees.]** *Les, Bratislava* 2 (5), 1955 (193–5). [Cz.]

Millions of seedlings in nurseries and a number of young Larch trees have been attacked in the last 2 years in Czechoslovakia by the fungus *Meria laricis*. Treatment of Larch seed with the dry fungicide 'Agronol' before sowing is recommended; diseased seedlings should be sprayed with Bordeaux mixture or other Cu preparations.

3872. GIBSON, I. A. S. **Sowing density and damping-off in Pine seedlings.** *E. Afr. agric. J.* 21 (3), 1956 (183–8). 6 refs. [Forest Department, Kenya.]

Greenhouse experiments were carried out with seeds of *Pinus patula* and, twice only, those of *P. radiata*, in soils known to contain *Rhizoctonia solani* and a smaller proportion of *Pythium ultimum* or an 8- to 10-day-old sand culture of *R. solani* mixed with soil. A statistically highly significant relationship was found between sowing density and damping-off in 4 experiments, although the incidence of disease varied considerably between experiments. Pre- and post-emergence loss were also closely correlated. Variations in atmospheric moisture (30–80 and 100% relative humidity) had little effect on the incidence of damping off. Comparison of (*a*) ordinary sowings, (*b*) as (*a*) with the addition of extra dead seeds, and (*c*) as (*a*) but with supplementary post-emergent sowing of live seeds, gave increasing incidence of damping-off—(*a*) 22·3, (*b*) 38·2, (*c*) 49·4%. A small laboratory experiment showed that the spread of *R. solani* was closely related to the available nutrient, in the form of killed germinated seeds, in the soil. Available nutrient seemed a more important limiting factor than competition from other members of the soil microflora.

3873. GIBSON, I. A. S. **Trials of fungicides for the control of damping-off in Pine seedlings. II. Field trials.** *E. Afr. agric. J.* 21 (3), 1956 (165–6). 1 ref.

Six fungicides (Dithane Z–78 [zineb-type], thiram 63%, Crag 658, Perenox, Phelam and Leytosol B), selected on the basis of results of greenhouse experiments [see *For. Abstr.* 17 (No. 1510)], were tested in 3 series of field trials at 11 forest stations selected to cover typical conditions in Kenya. None gave uniformly adequate control. Control by Dithane Z-78 appeared to decrease with increasing altitude, the other preparations proved erratic in effect and Dithane Z-78, thiram and Crag 658 were phytotoxic in some areas. Variations between stations in temperature, humidity and soil, and in incidence of pathogens, may account for the lack of uniformity. Other fungicides are to be tested, but these results suggest that no one fungicide will be effective and safe for nurseries throughout Kenya.

3874. CRAM, W. H. **Fungicidal control of *Rhizoctonia* damping-off.** *Tree Plant. Notes* No. 24, 1956 (17–8). 2 refs.

Experiments with *Picea pungens*, *Pinus sylvestris* and *Caragana arborescens* seed, sterilized and sown in soil inoculated with *Rhizoctonia* showed that application of captan or Tersan in water suspensions at 9 weekly intervals greatly reduced damping-off (losses reduced by 35% at lowest concentration) [cf. *For. Abstr.* 17 (No. 1505)].

3875. Shea, K. R., and Kuntz, J. E. **Prevention of damping-off of Poplar seedlings.** *For. Sci.* 2 (1), 1956 (54–7). 8 refs.

The following methods were tested for controlling damping off of Aspen seedlings in greenhouse flats: (*a*) 5 seed-protectant treatments, (*b*) 5 soil additives (dry fungicides), (*c*) 6 soil drenches, (*d*) soil steaming, (*e*) 7 germination media. Neither (*a*) nor (*b*) gave effective control and (*d*) was uncertain and sometimes harmful to the seedlings. In (*c*) both formaldehyde 37% (1/50 in water) at 4 pints/sq. ft., and boiling water at 8 pints/sq. ft., gave control. In (*e*) finely divided sphagnum moss controlled damping off and reduced transplanting damage. The standard method adopted since 1951 is described.

3876. Regler, W. Auftreten eines neuen Pappelschädlings in der DDR. **[Appearance of a new Poplar disease in Eastern Germany.]** *Wald* 3 (10), 1953 (312–3). 6 refs. [G.]

Reports the occurrence of *Septogloeum populiperdum* in Poplar nurseries on × *Populus robusta*, × *P. berolinensis*, × *P.* '*canadensis*' Leipzig, *P. trichocarpa* and × *P. bachelierii*. Describes the symptoms and suggests precautions against spread of the disease. [Cf. *For. Abstr.* 14 (No. 1315).]

3877. Faulkner, R., and Aldhous, J. R. **Bird repellents.** *Rep. For. Res. For. Comm., Lond. 1954/55*, 1956 (31).

Three proprietary makes of bird repellent, applied as seed dressings, were tested on Corsican Pine seed and compared with standard red-lead seed dressing, and with wire netting laid about 3 in. above and over the full width of the bed. No damage was observed until soon after general germination, when larks were observed working up the beds eating cotyledons and terminal buds. Wire netting was the only treatment giving protection in this case.

3878. Chaudry, G. U. **Black-headed cricket, *Acheta (Gryllulus) domesticus* as a pest of the seedlings of *Dalbergia sissoo* in the Punjab.** *Pakistan J. For.* 5 (4), 1955 (228–9 + 4 drawings + 2 photos).

This cricket, normally a household pest, is a serious field pest in parts of W. Pakistan, in one instance destroying large patches of seedlings in a *D. sissoo* nursery. Of control measures tried, the most successful was dusting with Hexidole 950 containing 1% γBHC.

3879. Schedl, K. E. Ein wenig bekannter Forstgartenschädling. **[A little known forest nursery pest.]** *Allg. Forstztg.* 65 (19/20), 1954 (244–5). [G.]

Describes a mass outbreak of *Otiorrhynchus ovatus*, damaging the roots of 2- to 3-year-old Spruce seedlings in a Carinthian nursery that had previously been successfully treated against cockchafer larvae with Cit 20 or Gamma-Streunex [γ-BHC preparations?]. Gesarol and Hortex [DDT?] applied as dust against the emerging weevils, gave good control. Other occurrences in Austria are mentioned.

3880. Maksimović, M., Hadžistević, D., and Radonjić, S. Ogledi suzbijanja grčica u šumskom rasadniku na Zlatiboru. **[Experiments in the control of chafer grubs in a forest nursery on Mt. Zlatibor.]** *Zašt. Bilja* No. 28, 1955 (45–54 + 2 plates). 2 refs. [Croat.e.] [Institut za Šumarska Istraživanja, Beograd.] I.M.I.

In the 'Palisad' nursery, stocked chiefly with *Pinus nigra*, sampling in April 1953 showed white-grub populations averaging from 3 to 11 per sq. m., mainly of *Amphimallon* spp. and *Melolontha melolontha*. Plots were treated in the latter half of the month with CaC_2 (*a*) or γ BHC (*b*). Sampling of grub populations on treated and control plots 5 months (and in some cases 1 year) later showed that (*a*) was ineffective even at rates equivalent to 800 kg./ha. Of the six commercial BHC formulations tried, those giving complete or almost complete protection were 'Lindane 25%', at 0·2 and 0·1% concentrations, applied at a rate of 5 litres/sq. m. (corresponding to 2·5 and 1·25 g./sq. m. of γ BHC), and 'Gamma Streunex' and 'Streunex FB' (γ BHC content 1·2% in both cases) at a rate of 100 kg./ha. The former was poured, and the two latter dusted, into furrows between the rows of plants.

232.328. Vegetative Propagation

See also No. 3638.

3881. Soukup, J. K otázce rozmnožování a pěstování eukomie (*Eucommia ulmoides* Oliv.)—gutaperčovníku mírného klimatu. **[Propagation and cultivation of *E. ulmoides*, the guttapercha tree of the temperate zone.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 28 (4), 1955 (573–612). 50 refs. [Cz.cz.russ.e.]

Reviews literature (mostly Russian) and describes the result of trials on the propagation (by cuttings and layering) and rearing of *E. ulmoides*, carried out at the Průhonice research institute (Czechoslovakia).

3882. May, C., and Hacsaylo, E. **New control unit developed for intermittent misting of cuttings.** *Amer. Nurserym.* 103 (8), 1956 (18).

Describes an apparatus devised at the Plant Industry Station, Beltsville, Md., to control intermittent mist irrigation of cuttings of Elm etc.

3883. Satoo, S. **[Origin and development of adventitious roots in seedling cuttings of conifers (II).]** *Bull. Tokyo Univ. For.* No. 48, 1955 (115–28). 5 refs. [Jap.jap.e.]

The origin and development of adventitious roots in cuttings from young seedlings of *Taxus cuspidata*, *Torreya nucifera*, *Larix leptolepis*, *Pinus densiflora*, *P. thunbergii*, *P. sylvestris*, *P. strobus* and *P. pinaster* are illustrated in photomicrographs. In *Taxus cuspidata* and *Torreya nucifera* most roots arose from callus tissue, as in *Cryptomeria*, *Thujopsis*, *Thuja* etc., but some from the phloem parenchyma near the cut, as in *Abies* and *Picea* [cf. *For. Abstr.* 13 (No. 269)].

All the roots of the Pines (except about $\frac{1}{7}$ of those of *P. strobus*, which arose from bud primordia) arose from callus in the normal manner. The exogenous origin of callus roots in *P. densiflora*, formerly reported, is now corrected. Roots in *Larix leptolepis* arose in connexion with bud primordia and leaf traces.

3884. WANG, T. T. **Effect of napthaleneacetic acid on propagation of Cypress cuttings**. *Memoirs of the College of Agriculture, National Taiwan University, Taipei* 3 (3), 1954 (27–42). [E.chin.] C.G.B.

Best rooting response was obtained in both *Chamaecyparis formosensis* and *C. taiwanensis* by treatment with α-naphthaleneacetic acid at concentrations of 100 p.p.m. Concentrations of 300 and 400 p.p.m. proved definitely toxic.

3885. HUCKENPAHLER, B. J. **Auxins fail to stimulate rooting of Yellow-Poplar cuttings**. *Bot. Gaz.* 117 (1), 1955 (73–5). 10 refs. O.B.D.

Treatment with selected concentrations of indolebutyric, indoleacetic and naphthaleneacetic acids failed to induce rooting in cuttings of *Liriodendron tulipifera*.

3886. STRZELECKI, W. Z badań nad wpływem stymulatorów wzrostu na ukorzenianie się zrzezów topoli. [**Investigations on the effect of growth stimulants on the rooting of Poplar cuttings.**] *Sylwan* 99 (2), 1955 (160–6). 4 refs. [Pol.]

Presents results of preliminary tests. Series I: *p*-nitrophenylacetic acid, 2,4-D, and SAS [SES?] had no effect on root formation in Poplar cuttings; nor had α-naphthaleneacetic acid or indoleacetic acid [IAA?], their higher concentrations even causing the cutting to rot; 1,4-CS [?] appeared to promote root formation in *Populus alba*, while niacine amide (amide of nicotinic acid) had a very good effect on *P. tremula*. Series II: niacine amide and/or α-naphthaleneacetic acid had no significant effect on *P. alba* cuttings. Series III: $KMnO_4$ or DDT had no effect on any cuttings; β-naphthoxyacetic acid, α-naphthoxyacetic acid and 2,4-D promoted earlier and more abundant root formation in *P. robusta*. Series IV: using the effective stimulants from Series III, it was found that: (1) *P. alba* reacted better than *P. robusta*, and (2) smaller concentrations are needed in spring than in winter. Series V: tests pointed to the specificity of different *Populus* species, and *P. alba* was here found less sensitive than either *P. robusta* or *P. tremula*. In Series VI, β-naphthoxyacetic acid, DDT, or BHC, gave the same results (in terms of mean height and diam. of shoots) as the controls.

3887. JECKALEJS, H. J. **The vegetative propagation of leaf-bundle cuttings of Red Pine, *Pinus resinosa*.** *For. Chron.* 32 (1), 1956 (89–93). 5 refs.

Leaf-bundles from 2 + 0 seedlings were immersed to a depth of 2 mm. for 12 or 24 hours in a 10^{-6} or 10^{-7} *M* concentration of methoxone (2-methyl, 4-chlorophenoxyacetic acid) and then planted out in boxes in the greenhouse. Those treated with 10^{-7} *M* for 24 hours rooted best (17 out of 25). [Cf. *For. Abstr.* 14 (No. 3328).]

3888. HUDSON, J. P. **Propagation of plants by root cuttings II. Seasonal fluctuation of capacity to regenerate from roots.** *Repr.* from *Journal of Horticultural Science, London* 30 (4), 1955 (242–51). 13 refs. (*Miscellaneous Publication, Department of Horticulture, Sutton Bonnington* No. 9.) O.R.E.

Batches of cuttings were made at regular intervals over a period of a year and cuttings from each batch planted in several different environments. The only woody species tested, *Populus nigra*, showed a seasonal variation in capacity to regenerate from root cuttings, this being greatest in winter.

3889. HOLST, M. J., SANTON, J. A., and YEATMAN, C. W. **Greenhouse grafting of Spruce and Hard Pine at the Petawawa Forest Experiment Station, Chalk River, Ontario**. *Tech. Note. For. Br. Can.* No. 33, 1956. pp. 24.

The techniques used for greenhouse grafting of Spruce (scions of 8 species grafted on Norway or White Spruce stock) and various 2-needle Pines (using Scots or Red Pine stock), are described. Details are given for preparation of rootstocks; collection, transport, and storage of scions; grafting schedules for autumn and winter; and the handling of grafts until they are ready for planting out.

3890. HOLST, M. J. **Scion storage and graft protection in the spring grafting of Red Pine.** *Tech. Note For. Br. Can.* No. 29, 1956. pp. 11.

Red Pine scions were grafted on Scots Pine rootstocks in June, in an investigation to test cold-storage and deep-freeze [0° F.] storage methods for winter-cut Red Pine scions, and to test the following methods of protecting and shading the finished graft: (1) a polythene bag covered with a kraft paper bag, (2) a kraft paper bag only, (3) a cardboard cylinder, and (4) unprotected control. Survival of healthy scions kept in deep-freeze storage is greater than for those kept in cold storage (80% and 57% respectively). For the above protection methods, grafting of healthy deep-frozen scions gave the following % take: (1) 89%, (2) 82%, (3) 73%, and (4) 72%. Comparable cold-storage scions gave (1) 74% (2) 67%, (3) 49%, and (4) 40% take. Scions damaged in transport gave the lowest take (33%). *From author's summary.*

3891. MERGEN, F. **Anatomical study of Slash Pine graft unions**. *Quarterly Journal of the Florida Academy of Sciences, Gainesville* 17 (4), 1954 (237–45). 16 refs. L.S.

Five 8-month seedlings were side-grafted with 10-month scions, and one union dissected each week, starting 1 week after grafting. Parenchymatous cells of medullary rays, phloem, cortex and cambium participated in bridging the gap. A continuous bridge between respective anatomical parts was apparent in the last dissection. The stock contributed most of the tissue.

232.329. Miscellaneous (including Greenhouses, Frames, Raising in Pots, Tubes etc.)

3892. JOHNSON, E. W., and VANDERSLICE, G. G. **An improved device for making paper pots**. *Tree Plant. Notes* No. 24, 1956 (3–5).

Describes, with illustrations, the improved machine for making pots from roofing paper [cf. *For. Abstr.* 17 (No. 362)].

232.33. Formation of Stands by Direct Sowing

See also Nos. 3575, 3795–8, 3808, 3811, 3914.

3893. Sieverts, A. **The cultivation of Teak in Java.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/22/12, 1956. pp. 2.

Briefly describes a successful method of regeneration by direct sowing in contour trenches with a cover crop of *Leucaena glauca* between the rows.

3894. Jaeger. Forstdüngung mit Thomasphosphat in der Waldgenossenschaft Stellheide. **[Fertilizing with basic slag in the Stellheide forest co-operative.]** *Forst- u. Holzw.* 11 (12), 1956 (256–7). [G.]

When, after strip ploughing and disk harrowing, this exposed sandy heathland near Hamburg was sown with a mixture of conifer seeds in 1940, one plot received 400, another 200 kg./ha. of basic slag, and one none at all. Basal area on these plots in 1956 was in the ratio of 8/3/1, and volume 7·5/2·5/1. Japanese Larch, which emerged as one of the dominant species, accounted for most of the increase, while Scots Pine, the other, responded in height but not in diameter growth. Of the other species present, Spruce responded well in number of stems/ha. and in height.

3895. **Mulching and screening of White Spruce seed spots on cut-over lands.** *Pulp Paper Mag. Can.* 57 (6), 1956 (183).

Survival on mulched and screened seed spots established 4 years earlier [see *For. Abstr.* 16 (No. 419)] was much higher (87% stocking) than on spots screened but not mulched (37%), mulched but not screened (19%), and unprotected (12%).

3896. Finnis, J. M. **The use of tetramine in the direct seeding of Douglas Fir in coastal British Columbia.** *Res. Note B.C. For. Serv.* No. 31, 1955. pp. 22. 8 refs.

Gives in some detail the results obtained and already published in interim reports [cf. *For. Abstr.* 17 (No. 580)].

3897. Tevis, L., Jr. **Seed spot method of censusing forest rodents.** *J. For.* 54 (3), 1956 (180–2). 8 refs.

To ascertain the presence (not population density) of mice (*Peromyscus* spp.) threatening direct sowings of conifers in California, seed should be sown in 100 spots, along a zigzag line in groups of five, 30 ft. apart with 6 ft. between spots. Number of seed per spot depends on size (5 for *P. jeffreyi* and *P. lambertiana* and 10 for *P. ponderosa* and Douglas Fir). *Peromyscus* visits are identified by clean pits at the exact spots and even incisions on the seed coats [cf. *For. Abstr.* 11 (No. 3314)].

3898. Mann, W. F., Jr., Derr, H. J., and Meanley, B. **A bird repellent for direct seeding of Longleaf Pine.** *J. For.* 54 (3), 1956 (190–1). 1 ref.

Where damage by meadow larks, savannah and vesper sparrows etc. is serious, a 200-acre trial has shown that the treatment of seed with an anthraquinone compound, e.g. the bird repellent 'Morkit', results in > 10 times as many seedlings. Seed is dipped in a sticker (1 volume asphalt/4 water) and the excess emulsion drained off. It is then tumbled in a drum containing ¼ lb. Morkit per 1 lb. of seed. Labour and materials add $0·15 to the cost of seed per lb. [cf. *For. Abstr.* 16 (No. 4035)].

232.4. Formation of Stands by Planting

See also Nos. 3795–6, 3809–12, 3822–3.

232.41. Planting Stock (Type, Handling and Treatment)

3899. Slocum, G. K., and Maki, T. E. **Exposure of Loblolly Pine planting stock.** *J. For.* 54 (5), 1956 (313–5). 5 refs.

Bare-rooted (*a*), water-soaked (*b*), and clay-puddled (*c*), 1-year-old Loblolly Pine plants were directly exposed to sun and wind for periods of 0, 30, 60, 90, and 120 minutes before planting. A total of 1800 seedlings (half large and half small) was used in the test. Final survival and growth measurements were made in November, 8 months after planting. Results showed that (*a*) from ordinary heel-in beds withstood ca. 30 min. direct exposure without a significant lowering of survival, (*b*) withstood longer exposure, but survival dropped sharply after 1½ hours, (*c*) withstood exposure for at least 2 hours without significant reduction in survival. Measurements of shoot growth indicate that the longer exposures reduce current height growth in the first year, but that (*c*) grow significantly faster than (*a*) or (*b*) regardless of length of exposure. *From authors' summary.*

3900. Wellenstein, G. Zur Frage der Schutztauchung der Forstkulturen. **[Protective dipping of planting stock.]** *Beiträge zur Entomologie, Berlin* 3 (5), 1953 (488–503). 20 refs. [G.g.] I.I.E.

Reports on large-scale experiments on the protection of Pine and Spruce plantations against cockchafer larvae, other soil-inhabiting insects, and *Hylobius*, by dipping the aerial parts or the roots, or both, in a suitable insecticide (or applying it to the roots as a powder) before planting out. The effectiveness and phytotoxicity of various preparations—mostly BHC or DDT—and the costs of these methods with others, such as trapping, spraying or brushing, are compared. Dipping in 0·4% of a preparation containing γ BHC + 1% of a preparation containing mixed γ BHC and DDT is suggested as a suitable and economical means of control against both types of pest.

232.42. Methods of Planting (including Use of Fertilizers etc.)

See also Nos. 3911–2.

3901. Jeník, J. Deformace kořenového systému dubu sadbou. **[Deformation of the root system of *Quercus* sp. as a result of planting.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 28 (1), 1955 (15–24). 20 refs. [Cz.cz. russ.]

Examination of 10 root systems of 12-year plantation Oak on a podzolized brown forest soil (Nižbor, Bohemia) showed that planting, if properly done, does not so deform the roots as to invalidate planting. Indeed, sowing should be resorted to only in very favourable conditions.

3902. Boggess, W. R., *et al.* **Sawdust mulch aids tree survival.** *For. Note Ill. agric. Exp. Sta.* No. 69, 1956. pp. 7. 3 refs.

A 4-in. mulch of hardwood sawdust gave increased survival of Norway Spruce transplants, but did not raise survival to a satisfactory level in abnormally dry weather on a sandy soil. Application of NH_4NO_3 in the first year was detrimental to Norway Spruce in the conditions mentioned above. At the end of one year there was a trend towards soil acidity on all except unmulched, unfertilized control plots.

3903. Shibamoto, T., Nakajima, S., and Inoue, T. **[Studies on the soil amelioration of the denuded forest land about Seto in Aichi Prefecture (I). On the effects of horizontal ditch ploughing and fertilizing on the growth of *Pinus thunbergii* Parl.]** *Bull. Tokyo Univ. For.* No. 48, 1955 (153–68). [Jap.jap.e.]

Nursery seedlings were planted out in contour furrows ploughed at 1-m. vertical intervals. Field treatments of six 1000-sq.-m. plots (control, rice straw, compost or chemical fertilizers, alone or in combination) were paralleled by pot tests. With rice straw two kg. were buried at the foot of each plant. The effect of complete NPK was increased by the cultural measures. Compost improved root growth, but used alone it is inadequate owing to incomplete decomposition or deficiency in P. Fertilizer effects became significant both on height and diameter growth from the second season. Correlations were calculated for (*a*) projection area of crown, (*b*) rooting area, (*c*) weight of stem and branches, (*d*) weight of roots, (*e*) weight of needles, (*f*) length of trunk, (*g*) length of roots. Between (*a*) and (*b*), and (*c*) and (*d*) they were slight; but between (*c*) and (*e*), (*c*) and (*f*) and (*f*) and (*g*), positive and strong.

3904. Aird, P. L. **Fertilizers in forestry and their use in hardwood plantation establishment.** *Pulp Paper Mag. Can.* 57 (3), 1956 (376 . . . 384). 10 refs. (*Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 1542 (*F*-2).)

The effects of fertilizers (broadcast and applied in the planting hole) and of tillage on first-year terminal-shoot and volume growth were highly significant in 1-year *Populus nigra* × *deltoides* cuttings, grown on an abandoned podzol on river-terrace sand. The best growth was with commercial 10–10–10 NPK put in the hole, the plot being roto-tilled before, and hand-hoed after, planting. Optimum dosage for the first year on tilled plots is ca. 1 oz./plant but 4 oz. is suggested for field planting, as possibly eliminating the need for cultivation. No significant increase of growth was got by treating weeds with maleic hydrazide-40; it even checked growth on tilled plots. Weeds reduced not only rate of growth but also length of growing season.

3905. Laube, R. Lochpflanzung mit dem Hohlspaten. **[Hole planting with the concave spade.]** *Wald* 3 (5), 1953 (140–1). [G.]

Describes the tool and the working method used for reforestation with Spruce, Larch and broad-leaved transplants on clayey loam in the Vogtland. The turning of the spade when digging the hole smooths its walls and renders them less permeable, thus preventing dissipation of moisture. Mortality by this method for spring planting was 3%, against 30% for holes dug the previous autumn.

232.43. Spacing and Arrangement in Plantations

3906. Kiellander, C. L. Lämpligt förband vid plantering av gran i Sydsverige. **[Suitable spacing for planting Spruce in S. Sweden.]** *Skogen* 43 (9), 1956 (267–8, 291). [Sw.]

Concludes, from past and current experiments, that except in special conditions (e.g. planting under existing stands, planting for pulpwood, planting when material is scarce) 1·5 × 1·5 m. is the maximum desirable spacing, especially for the coarser-branched Spruce of 'continental' provenance.

3907. Russell, T. E., and Derr, H. J. **Longleaf height unaffected by stand density.** *Sth. For. Notes Sth. For. Exp. Sta.* No. 101, 1956 (2).

Densities in a Louisiana plantation varying between 2500 and 250 at time of planting (1934/35), and between 404 and 66 by 1955, produced stands whose dominant trees averaged 42·4 and 39·9 ft. respectively, the difference not being statistically significant.

232.44. Season and Time of Planting

3908. Dunikowski, S. Wpływ warunków atmosferycznych na przestrzenne zróżnicowanie wyników upraw wiosennych w roku 1953. **[Influence of atmospheric conditions on regional results of spring plantings in 1953 [in Poland].]** *Roczn. Nauk leśn.* No. 11, 1955 (131–43 + 5 maps). 5 refs. [Pol.pol. russ.e.] (*Prace Inst. bad. Leśn.* No. 140.)

Air temperatures (absolute extremes and monthly means) and precipitation (in % of normal, for every month), as obtained from 59 Polish meteorological stations, were charted on maps. These maps were then compared with those showing the success of spring planting, viz. (1) E. zone with success < 85%, (2) W. zone with the same success, (3) N. zone with success slightly > 85%, and (4) S. zone with success 85–96%. It was found that zones 1 and 2 had unfavourable conditions for spring planting, in particular a low rainfall of uneven occurrence; high air temperature, winds, and large daily amplitudes of temperature in April were also harmful.

3909. Crossley, D. I. **The possibility of continuous planting of White Spruce throughout the frost-free period.** *Tech. Note For. Br. Can.* No. 32, 1956. pp. 31. 8 refs.

In 1952 a study was initiated on the Kananaskis Forest Experiment Station, in the subalpine forest region of Alberta, to investigate the possibility of continuous planting of White Spruce throughout the frost-free period. Weekly plantings were undertaken and 2016 transplants set out in a statistically designed experiment in each of the 1952, 1953 and 1954 seasons, data being collected on mortality and on annual height growth of the survivors. It was originally expected that success would be correlated with root growth, which was reputed to be active when aerial growth was inactive and relatively inactive when aerial growth was active. This periodicity of root growth was superficially investigated as part of the study, and appeared to be substantiated, but the survival results in the field plantations do not appear to be correlated. The results obtained to date can be listed as follows: Mortality has been acceptably low throughout the planting season, but has been highest whenever the soil at the time of planting was powder-dry. Height growth has been variously depressed, depending on the period of planting. A hypothesis is offered to account for this behaviour, and centres round the effect of the shock of transplanting on the organ primordia. A concomitant effect of the depressed height growth is chlorotic foliage and short needles. The plants set out in the varying seasons appear to be recovering from the effects of transplanting. The results obtained to date are encouraging and suggest the possibility of continued planting throughout the frost-free period, at least during seasons or periods of normal or above-normal precipitation. Unfortunately, no abnormally dry seasons were experienced during the course of the investigation. *From author's summary.*

3910. GALOUX, A. Enquête sur la plantation du sapin de Douglas. **[An enquiry on the planting of Douglas Fir.]** *Bull. Soc. for. Belg.* 63 (4), 1956 (172–6). [F.]

Further data on plantations in Belgium confirm previous findings [cf. *For. Abstr.* 16 (No. 2969)] that spring is the safest time for planting Douglas Fir in Belgium, but that summer and autumn planting are also satisfactory except in the Ardennes. Mound planting is best on all sites and if possible, planting stock should be raised in (possibly temporary) nurseries as near as possible to the planting site. Tabulated data are given from 49 plantations.

233. Afforestation

See also Nos. 3809, 3894, 3903, 3933.

3911. **Mechanized equipment for afforestation work in France.** *Unasylva* 10 (1), 1956 (37–41).

Contributed by the Direction Générale des Eaux et Fôrets. Includes illustrated notes on cultivators, bulldozers, hole diggers, planting machines etc.

3912. JAMESON, J. S. **Planting of conifers in the Spruce Woods Forest Reserve, Manitoba 1904–1929.** *Tech. Note For. Br. Can.* No. 28, 1956. pp. 29. 13 refs.

From 1904 to 1929 in the Spruce Woods Forest Reserve, the Forestry Branch set out several coniferous species on 204 acres, in 62 experimental plantations, for the purpose of determining the species and method most suitable for large-scale planting. The seedlings planted were Scots Pine, Jack Pine, Lodgepole Pine, White Spruce, and a small amount of Norway Spruce. The plantations were set out on the sandy soils of the old Assiniboine river delta. In 1952, the 33 surviving plantations were examined. In plantations of one acre or less, a 100% diameter tally was made, while in those larger than one acre, rows were selected at random to give an approximate one-acre sample. Information on the soil, site, cone production, regeneration and vegetation was also collected. Though inadequate experimental design and infrequent remeasurements of plantations precluded comprehensive analysis of growth and mortality, the data from the 1952 survey and from past records indicate that: Average survival in the plantations existing in 1952 was about 40% for Jack Pine, 35% for Lodgepole Pine, and 20% for Scots Pine. Norway Spruce and White Spruce were complete failures. Drought and heat were the chief causes of mortality, White Spruce, Norway Spruce, and Scots Pine being most affected. Rabbits, pocket gophers and competition from grass caused additional losses to all species. Winter dying caused mortality and damage in Scots Pine and White Spruce but hardly affected other species. Planting in furrows and in Cedar [*Juniperus horizontalis*] mats were the most successful techniques, the former being preferable. Underplanting in Poplar was a failure, primarily owing to the higher incidence of rabbits. Jack Pine shows the best growth rate and form. Survival, rate of growth, and form in the Scots Pine plantations are better where the stock originated from Swedish and German seed. *From author's summary.*

3913. BUCH, M. W. v., HAARDT, M., and FRIEDRICH, A. G. Erfolgreiche Erstaufforstung bei schwierigen Standortsverhältnissen im Privatrevier Bliesdorf. **[Successful afforestation of difficult sites on the private estate of Bliesdorf.]** *Mitt. Bundesforsch-Anst. Forst- u. Holzw.* No. 38, 1956. pp. 52 + ii. 30 refs. [G.g.]

Describes the history and present condition of ca. 350 ha. of forest near Lübeck, most of which was created within the last 100 years by the afforestation of wet heathland, chiefly with conifers, of which Pine was mostly successful, and Spruce less so, partly for reasons of site, partly because of constant damage by red deer. Japanese Larch and Douglas Fir have recently been introduced and seem promising. The broadleaved sector, apart from old Alder coppice, is mainly Oak and Beech, the latter of rather poor growth and inclined to form raw humus. Sites, often characterized by periodic waterlogging, are roughly classified into pseudogleys, podzols, and gley podzols; soil structures, and methods of draining, cultivation and planting, including the use of fertilizers are discussed and the work compared with similar projects in N. Germany [cf. *For. Abstr.* 14 (No. 3340)]. Moderate and gradual drainage, plus shallow cultivation, are considered important factors contributing to the success of these operations.

3914. WOOD, R. F., and ZEHETMAYR, J. W. L. **Problems of afforestation.** *Rep. For. Res. For. Comm., Lond. 1954/55*, 1956 (32–4).

Pilot plots planted on difficult peat areas in the north are mostly still showing good growth, but it is evident that exposure to wind is a more serious factor affecting establishment than soil conditions. A scheme for evaluating the exposure factor by the rate of tattering of unhemmed linen flags of a standard design has been put into effect over a wide range of sites, to determine what degree of exposure to wind can be considered as limiting. On the Lizard peninsula of Cornwall, on soils over serpentine rock, a trial of 19 species has been laid down. Direct sowings, which failed in the previous year, are being experimentally protected by a spray of bituminous emulsion after sowing. Bituminous sprays are also being tried for fixing sand dunes on Anglesey, following successful Russian practice [cf. *For. Abstr.* 15 (p. 264)].

3915. COUPPIS, T. A. **Reclamation of sand dunes with particular reference to Ayia Erini sand drifts, Cyprus.** *Emp. For. Rev.* 35 (1), 1956 (77–84).

Sand-dune reclamation has been practised in Cyprus for the last 50 years. Successful works are the plantations of Salamis, Famagusta and Limassol which were planted to *Acacia cyanophylla*, *Pinus pinea*, *Eucalyptus rostrata*, *E. tereticornis* and *E. gomphocephala*. The Pine and Eucalypts attained a girth of over 6 ft. within 40 years, while the Wattle was cut for firewood on a rotation of 7–10 years. Canes, *Tamarix*, *Dodonea* and *Lycium barbarum* were also tried successfully near the shore. Attempts to reclaim the Ayia Erini sand drifts were made between 1925 and 1929 but failed, partly because of wrong technique and partly because of leaving the area unprotected after 1931. Reclamation was attempted again in 1940, using one-year-old nursery seedlings and watering during the first rainless summer. At the same time experiments were carried out which demonstrated that Pines could be raised from seed *in situ* provided the soil temperature was lowered. Superficial water was not a limiting factor because of the Pine's long tap-root. Soil temperature was lowered by sowing on ridges or mounds or by dressing the planting site with white soil which does not absorb so much heat. By direct planting, costs were reduced to less than $\frac{1}{20}$ of the original cost Wattle, unlike the Pine, uses superficial water because it has no definite tap-root and a widely spread root system. The seedling can be buried 2–3 ft. deep with advantage. This helps to support the young plant and keeps it in a moist horizon. Wattles, 4 in. in diameter and 15 ft. high, were raised in 9 months by watering the plants twice a week during the hot summer. As a preliminary to reclamation, the active dunes were put under control either by making fences 4–5 ft. high or by covering the area with brushwood. This is essential for about a year or two until the Wattle grows up and checks the wind. *Tamarix* and canes are also useful hedge plants near the shore as both of them are tolerant of salt spray. *From author's summary.*

3916. **Planting around dumps.** [*Pap.*] *6th tech. Mtg. int. Union Prot. Nature, Edinburgh 1956* No. *IUPN/A.G.5/R.T.* 6 III/8, 1956. pp. 2. [Siedlungsverband Ruhrkohlenbezirk, Essen.]

Recommends tree and shrub species for planting on spoil mounds with (*a*) better soils, (*b*) light soils.

3917. SCHOMAKER, C. E. **Loblolly Pine succeeds on spoil banks.** *Sth. For. Notes Sth. For. Exp. Sta.* No. 102, 1956 (2–3).

Loblolly Pine had the highest survival rate (77%) and height growth (19 ft. after 10 years) of Pines and hardwood species planted on 1-year-old spoil banks caused by strip mining for coal in N. Alabama.

3918. **Pines thrive and hardwoods fail on Ozark old fields.** *Rep. Sth. For. Exp. Sta. 1955* [1956] (16–7).

In plantings made in 1950, Loblolly, Virginia, and Shortleaf Pine have shown best development. *Liriodendron tulipifera*, Black Walnut, White Oak, Eastern Red Cedar, Eastern White Pine and Pitch Pine showed either poor survival, or poor growth, or both; Black Locust was heavily infested with borers. In general, conifers grew best on loamy sands, and surviving hardwoods on cherty silt-loam sites.

3919. KORENEK, J. Zur Frage der Borstengrasweidenaufforstung in der Slowakei. **[The afforestation of *Nardus stricta* grassland in Slovakia.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/21/11, 1956. pp. 3 + 1 photo. [G.]

Reviews some past attempts to afforest this type of grassland: success depends largely on choice of species (*Picea abies*, *Larix decidua* and *Pinus mugo* have done best), selection of the right provenances, proper planting methods, and the elimination of the grass.

3920. GAYL, A., and HECKE, H. Neuere Erkenntnisse zur vorbeugenden Lawinenbekämpfung. **[Progress in preventive avalanche control.]** *Allg. Forstztg.* 64 (7/8), 1953 (92–6). [G.g.]

Stresses the need for work on windward slopes and of windbreaks near mountain crests, to prevent snow driving on to the, often leeward, avalanche runs. Control through single, even stunted, trees (e.g. *Sorbus aucuparia*), shelterbelts or larger blocks of forest, alone or in combination with temporary artificial barriers is discussed.

3921. Die Wiederbewaldung des Hochgebirges. **[Reforestation of high mountains.]** *Allg. Forstztg.* 64 (13/14), 1953 (157–71). [G.]

A special number mainly devoted to the problems considered most urgent in Austria, i.e. the competition for alpine pastures, and the role of high-lying forests in torrent and avalanche control, with articles on: The plant-sociological bases for the reforestation of alpine regions (*E. Aichinger*); The timber-line in Styria (*O. Eckmüllner*)—reporting the raising of the line where the use of mountain pastures has been reduced; and Appliances for reforestation in mountain regions (*W. Bitterlich*)—describing experiments on a trial plot near Zell-am-See at 1850 m. alt., using specially constructed planting tubes, and protective stakes.

3922. AHMAD, S.-U.-D. **Afforestation in arid and semi-arid areas.** *Pakistan J. For.* 5 (4), 1955 (216–27). 16 refs.

A paper read at the UNESCO international symposium on plant ecology in the arid zone, held at Montpellier in Nov. 1953. Reviews the progress made, and silvicultural techniques evolved in various parts of the world, and indicates problems on which further research is needed.

3923. KHAN, M. I. -U. -R. **Reclamation of degraded lands in the Punjab.** *Emp. For. Rev.* 35 (1), 1956 (64–71). 11 refs.

Describes briefly the methods being used to rehabilitate eroded, over-grazed, and desiccated land in the W. Punjab (e.g. irrigated plantations, contour trenching, gulley plugging). The saline and alkaline soils are being reclaimed by flooding and growing rice with large quantities of water.

3924. NEGI, S. S. **Soil conservation in the Uttar Pradesh under the Uttar Pradesh-Rajasthan border afforestation scheme.** *Indian For.* 82 (3), 1956 (114–5).

Ravine and gulley plugging, and contour trenching and planting on slopes are the methods being employed. A system of discontinuous, staggered trenches 20 ft. long, is described, which costs much less than continuous trenching. Total costs for treating such an area are Rs.85–110/acre depending on the soil; this includes cost of seed and plants, 3 weedings, fencing etc.

235. Underplanting, Advance Planting etc. Nurses and Formation of Mixtures. Interplanting of Inferior Growth

See also Nos. 3793, 3893, 3944, 3959, 4093.

3925. VENKATARAMANY, P. **Underplanting in Teak plantations in Madras State.** *Indian For.* 82 (5), 1956 (225–36). 7 refs.

Reviews the results of some small-scale experiments in underplanting pure Teak plantations in Madras in 1928, discusses some other experiments in underplanting in Burma, Travancore and Java, and concludes that underplanting pure even-aged Teak with Bamboos or tree species will reduce volume increment of Teak and is not desirable. Research is recommended on underplanting with shrubs of economic importance, such as *Cinnamomum zeylanicum* or *Rauwolfia serpentina.*

3926. KRISHNASWAMY, V. S. **Cover and nurse crops in Sal (*Shorea robusta*) and Teak (*Tectona grandis*) plantations at Dehra Dun.** *Indian For.* 82 (4), 1956 (153–70 + 4 photos).

Describes a series of investigations to determine the practicability of improving and accelerating the establishment of Sal and Teak plantations on exhausted agricultural land by the use of nurse and cover crops. The following general conclusions were reached: *Leucaena glauca*, *Tephrosia candida*, *Indigofera endecaphylla*, *I. galegoides* and *I. tinctoria* were successfully raised with Sal, but the only species that appeared to benefit the latter's growth (and that doubtfully) was *L. glauca.* None of the species proved successful with Teak and all needed intensive weeding to get them established. *L. glauca*, *T. candida* and *I. endecaphylla* were all partly successful as weed suppressers; after being partly damaged by frost for the first few years, they proved reasonably efficient frost nurses for Sal, but *T. candida* was too short-lived and *I. endecaphylla* too small a plant to be really useful. *I. endecaphylla* was definitely harmful to Teak. A cover crop of *T. candida* reduced the moisture content of the soil, increased organic C and N, and slightly reduced pH. *From author's summary.*

3927. FOURY, P. Comparaison des méthodes d'enrichissement utilisées en forêt dense équatoriale. **[A comparison of the methods used for enriching tropical rain forest.]** *Bois For. Trop.* No. 47, 1956 (15–25). [F.]

Reviews previous articles in this journal and concludes that line planting is, in most cases, more economical and efficient than the tropical shelterwood system as a means of improving such forests. [Cf. *For. Abstr.* 15 (No. 1358); 16 (Nos. 456, 1589); 17 (Nos. 3775–6, 3786).]

236. Care of Regeneration or Plantations in the Initial Stages of Establishment (including Regeneration Surveys)

See also Nos. 2812, 3904, 3944, 4073.

3928. GEISLER, G. Einiges zur Frage des Pappelanbaus und der dringend notwendigen Schutzmassnahmen für die Pappel. **[The problem of Poplar planting and the urgency of protective measures.]** *Wald* 3 (9), 1953 (272–4). [G.]

Discusses the reasons for the frequent failures of recent plantings in Mecklenburg, estimated at 75% of all Poplars planted since 1945, and stresses the need for correct choice of site and for tending in early years.

3929. ZOLLONDZ, G. Das mechanische Hacken der Nadelholzkulturen mit dem Gallinger Hackgerät. **[Mechanical hoeing of conifer plantations with the Galling hoeing implement.]** *Wald* 3 (7), 1953 (216–7). [G.]

The implement has two thin circular cutters set on the frame at an angle to the direction of movement. When the implement is pulled along (two can be drawn by one horse, walking between the rows) it hoes a strip of 15–20 cm. on each side of the plants, which are protected by a guide rail from damage by the disk-shaped wheels. The implement is stated to be light, easy to handle, and capable of halving the costs of hand hoeing 1-year-old Pine.

3930. **Grass competition hurts Longleaf seedlings in Louisiana and Mississippi.** *Rep. Sth. For. Exp. Sta. 1954* [1955] (17–9).

Hoeing and clipping an 18 in. circle round seedlings each May did not significantly assist survival at 2 years, but did increase growth; hoeing more than doubled the number of vigorous plants where brown-spot disease was controlled by spraying. Where grass had been destroyed by allyl alcohol, mean diameter at base of 2-year seedlings was 0·43 in. against 0·28 in. on controls (also with brown-spot control). A third study, comparing clipping with extermination of grass, indicated that root competition, rather than competition for light, was the detrimental factor.

3931. LANCASTER, P. C. **Three methods of assessing the quantity of natural regeneration.** *Inform. Bull. For. Dep. Nigeria* No. 25, 1955. pp. 4.

Describes briefly the Nigerian 25% seedling count, the Malayan milliacre method, and the Gold Coast quadrat method, and compares results obtained by them. Concludes that none gives anything approaching an accurate figure for seedlings in the 0-3 ft. height class, but that approximate figures for the higher classes can be obtained with the Malayan and Gold Coast methods. The Nigerian method, although very conservative and unsatisfactory for research purposes, may be satisfactory for administrative purposes; its cost is low.

237. Amelioration of Forest Sites

See also Nos. 3848, 3894, 3902–4, 3913, 4057, 4093, 4653.

3932. PECHMANN, H. VON, and RONDE, G. Versuche mit Bodendeckung gegen austrocknende Windwirkung an offenen Waldrändern. **[Experiments in mulching to counteract the desiccating effects of wind on open forest margins.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/11/3, 1956. pp. 3. [G.]

Mulching with potato haulms or hop waste to a depth of 10 cm. for 30–50 m. inwards from the edge of a forest margin unprotected from drying winds, resulted in a great increase in numbers of soil fauna, a beneficial change in the composition of soil fauna populations, and higher pH values.

3933. THURMANN-MOE, P. Eldre og nye skogkultur- og gjødslingsforsøk på Åsmyra. **[Old and current research on forest plantation and fertilizer experiments at Åsmyra.]** *Norsk Skogbr.* 2 (8; 9), 1956 (269–81; 309–15). [Nor.]

Reviews experiments since 1875 on a classic example of a drained peatland site, with results, including some tabulated data on volume production, increment etc. on plots with and without fertilizer. Concludes that drainage and afforestation, with the use of fertilizers, on the many similar Norwegian sites hold great promise, but that there is scope for much more research.

3934. GESSEL, S. P., and WALKER, R. B. **Height growth response of Douglas Fir to nitrogen fertilization.** *Proc. Soil Sci. Soc. Amer.* 20 (1), 1956 (97–100). 10 refs. O.R.E.

Repeated fertilizing of 15- to 20-year-old second-growth Douglas Fir, on N-deficient West Washington sites, with NH_4NO_3, $(NH_4)_2SO_4$ and urea at 100 lb./acre resulted in greater height growth, better needle colour and greater N content of needles. Vigorous trees responded better than weaker ones and were enabled to suppress them. The possibilities of commercial use of N, e.g. for Christmas trees, are discussed.

238. Timber Plantation Crops Requiring Special Treatment

See No. 3928.

24. Tending of Stands and Trees

See also No. 4258.

241. Cleaning

See No. 3734.

242. Thinnings

See also Nos. 3717, 4297, 4315, 4333, 4373–5, 4556, 4568, 4653.

3935. Die Durchforstung, eine dringende Gegenwartsaufgabe. **[Thinning, an urgent task today.]** *Allg. Forstztg.* 64 (17/18), 1953 (209–29). [G.]

A special number, discussing both the need for, and the difficulties of, adequate thinning, particularly crown thinning, in the alpine forests of Austria, including articles on forest work in thinning, size of gangs, tools, etc.) (*H. Mächleri*); extraction of thinnings (*F. Hafner*); and extraction of thinnings in badly opened-up mountain forests without mechanical aids (*J. Kummer*), with practical hints, including the protection of the remaining stand by windrowed slash.

3936. DABRAL, S. N., and RAWAT, A. S. **Interim results of comparative thinning investigation of *Cryptomeria japonica*.** *Indian For.* 82 (5), 1956 (237–41). 2 refs.

Thinning plots were laid out in 1932 in a 12-year plantation of *C. japonica* in Darjeeling Forest. To date, thinnings have produced a notable increase in crop height and diameter increment compared with controls. Timber from fast-grown trees has only 2 rings/inch compared with 10–12/inch in best-quality timber from Japan.

3937. PUDDEN, H. H. C. **The pruning and early thinning of exotic softwoods in Kenya.** *Pamphl. For. Dep. Kenya* No. 13, 1955. pp. 15. 4 refs.

To simplify for untrained staff the thinning of softwoods up to 12–14 years, of which there are some 50,000 acres in Kenya, the Queensland 'eclectic' system of marking has been adopted. Africans have readily learned it. The best tree in the first group of 4 along a planted line is marked with paint or distemper. The groups subsequently examined are running groups made by adding one at the forward and subtracting one at the rear end in the marker's progress along the line. In each such group the best tree is selected according to precise instructions, so that every tree except the 3 outside ones in the groups on the plantation's margins is examined 4 times. Where there are 4 blanks, the flanking trees are inevitably selected. Where the choice is doubtful, that tree is retained which gives the greater growing space in relation to trees retained in the previous line. The chief criterion for retention is good diameter growth and a place among the dominants. This marking is done only after a pruning to 6 ft. (for visibility). The marked trees are further pruned as soon as possible to 60% of total height, one lower whorl being spared where whorls are widely spaced (as in Pines) in order to maintain a good crown. Specific pruning instructions for *Cupressus lusitanica*, *C. benthamii*, *Pinus radiata* and *P. patula* are given. Marking for retention is done at the age of 5, 6 or 7 years, preferably at 5 or even, in very fast growing crops, 4; removals are effected in 2 or 3 stages. This marking results in reserving about 250–260 stems/acre in an 8 × 8 ft. plantation or, with the refinement of a minimum diameter (the rules for which are described), 230. The object of thinning is to produce in these species a mean d.b.h. of 18 in. at 35 years. Priority in thinning is given first to competing neighbours, then to suppressed, damaged, diseased and dead trees. The deformed and top-damaged and small sound trees are then drawn upon to maintain the required density, the main rule of which is to keep the canopy open, until all discarded trees are removed. The general objective is a density of 250 stems/acre at a mean height of 60 ft. on the better and 50 ft. on the poorer sites. An example of thinning 5 acres is detailed.

3938. SIRÉN, G. Männikön harvennuksesta. **[Thinning Pine stands.]** *Metsät. Aikak.* 1956 (2/3), (40 . . . 49). 12 refs. [Fi.e.]

In a critical review of the basic principles of thinning in managed Pine stands, the author suggests that the amount of and interval between thinnings should be more elastic, with longer intervals towards the end of the rotation. Graphs are presented showing thinning regimes characterized by the removal of (*a*) a constant % of standing volume, with thinning intervals increasing towards the end of the rotation, (*b*) a constant amount of standing volume, with equal thinning intervals, (*c*) a constant amount of basal area, with increasing thinning intervals; all plotted within curves representing 83 and 50% of the volume of natural Pine stands (Ilvessalo's yield tables). The possibilities of practical application are discussed.

3939. DIMOCK, E. J. **Selection thinning in young-growth Douglas Fir (a 6-year progress report).** *Res. Note Pacif. Nthwest. For. Range Exp. Sta.* No. 127, 1956. pp. 6.

Results of a system concentrating on removing trees of the dominant crown class by 4 light thinnings at roughly 2-year intervals from 1949 to 1955 are given in graphs showing number of trees per acre, diameter, b.a., and volume through the period, and a table showing the financial analysis.

3940. STAEBLER, G. R. **Evidence of shock following thinning of young Douglas-Fir.** *J. For.* 54 (5), 1956 (339). 2 refs. [Pacific Northwest Forest and Range Experiment Station, Portland, Ore.]

Measurements of height growth were made for several years on thinned and unthinned plots in a 23-year-old plantation of Douglas Fir (600–650/acre, mean height 29 ft., mean d.b.h. 4 in.). Plots were thinned to leave 50, 100, 150, 200, 250, and 350 trees/acre. Height growth fell off sharply in all thinned plots in the first season after treatment, though average leader length increased in untreated plots. The difference in leader length between thinned and unthinned plots was of high statistical significance, but there was no significant difference between different intensities of thinning. This was expected, because, even in the lightest thinning, the remaining trees were completely released. The reduction in height growth is considered to be evidence of shock. The experiment continues.

3941. LITTLE, S., and SOMES, H. A. **Thinning young Oak stands on poor sites in southern New Jersey does not pay.** *For. Res. Note Ntheast. For. Exp. Sta.* No. 58, 1956. pp. 4.

Cites results of a thinning study begun in a typical stand of mixed Oaks (site index about 50 ft.) in the Lebanon Experimental Forest in 1935. These show that neither basal area nor diameter was significantly different between unthinned plots and those given heavy, medium and light thinning.

243. Opening of the Canopy (Increment Fellings, Overhead Release and Improvement Fellings)

See also Nos. 4078, 4081–2.

3942. **[Management of Red Pine.]** *Rep. Lake St. For. Exp. Sta. 1955* [1956] (44–7).

(1) In Lower Michigan, 30- to 65-year overstorey Oak was removed to release Red Pine [*Pinus resinosa*] that had been suppressed for 3–40 years; height and diameter growth of Pine of all ages showed a considerable increase over unreleased trees 5 years after release. (2) In pruning experiments in Michigan, 4 methods of pruning were used: (*A*) bottom whorl cut and buds removed annually; (*B*) bottom whorl cut, uppermost whorl removed at the end of each growing season; (*C*) bottom whorl uncut, buds removed annually ; (*D*) bottom whorl uncut, uppermost whorl removed at the end of each season's growth. All treatments caused reduction in height growth, (*A*) and (*B*) by 35–40% and (*C*) and (*D*) about 20%, compared with the unpruned control. (3) Early results of tests in Lower Michigan in a 47-year Pine plantation indicate that stocking levels of 80–140 sq. ft. b.a. give about the same rate of cordwood growth; levels of 60 and 160 sq. ft. are less productive.

3943. MILLER, W. D., and TISSUE, O. C. **Results of several methods of release of understorey Loblolly Pine in upland hardwood stands.** *J. For.* 54 (3), 1956 (188–9). 1 ref.

A detailed statistical study of an area in N. Carolina, where hardwoods 4–20 in. in diam. predominate in the overstorey and Pines < 35 ft. high are 1040–2590/acre, shows that in 2 growing seasons after liberation of the Pine understorey by felling the hardwoods or poisoning them with Ammate, the height and diameter growth of Pines up to 9 ft. high were respectively doubled and quadrupled. Felling was 4–5 times as costly as poisoning and caused greater damage, but the cost of the former may be recoverable if the fuel or pulpwood can be sold. [Cf. *For. Abstr.* 16 (No. 1727).]

3944. SHOULDERS, E. **Release underplanted Loblolly early.** *Sth. For. Notes Sth. For. Exp. Sta.* No. 100, 1955 (2–3).

In a study in Louisiana, Pines planted under hardwoods standing ca. 330 stems/acre, averaged 16 ft. in height after 7 years if released at planting time, against 9·5 ft. if not released, the mean respective survival rates being 82 and 46%. Complete release gave no better results than the partial release obtained by removing only hardwoods > 3 in. in diameter.

3945. DOOLITTLE, W. T. **Axe or machine girdling**. *Sth. Lumberm.* 191 (2393), 1955 (152, 157). [Southeastern Forest Experiment Station.]

A study on the effect of species, diameter, and topography on girdling times by axe and the 'Little Beaver' [cf. *For. Abstr.* 16 (No. 4085)]. An average Hickory took about 3 times as long to girdle by machine as Oaks, Red Maple, or Sourwoods of similar size. Machine girdling was nearly twice as fast as axe girdling for Hickory and nearly 3 times as fast for other species. Steep slopes increased girdling times for these latter, but not markedly for Hickory. Because of its weight, steep slopes and a small number of trees/acre reduce the advantage of the machine over the axe.

3946. **[Axe girdling.]** *Rep. Sth. For. Exp. Sta. 1954* [1955] (33).

Girdling by either cutting the bark only, chipping the sapwood, or completely severing the sapwood, applied to Post, Scarlet, and Southern Red Oaks in May, resulted in 75, 92, and 100% crown kill respectively. Corresponding times until death occurred were 81, 67 and 11 days.

3947. CARNES, E. T., and WALKER, L. C. **Complete frilling essential for hardwood control**. *J. For.* 54 (5), 1956 (340).

Incomplete frill girdling results in a much reduced kill. It was found that, where unskilled labour had been used, a poisoning operation was largely wasted. Whereas proper poison frill-girdling gives 96% kill, a frill covering only 90% of tree circumference gave only 38% kill. No trees died that had < 30% girdle. Tree size (2–21 in. d.b.h.) had no apparent effect on mortality.

3948. DAVIS, J. R., and DUKE, W. B. **Quick, Bunyan, the needle. Tree injector kills cull hardwoods**. *Sth. Lumberm.* 191 (2393), 1955 (171–2). 1 ref.

The tool, called after its inventor the 'Little' tree injector, consists of a pipe-like barrel, holding 7 pints, and exchangeable chisel-like bits of hard steel. A trigger on one of the handles releases the poison. Weight, when full, is 16 lb. In a study in Texas on 22 acres of Pine uplands, 5609 stems, mostly Oaks with a mean diam. of 2·1 in., were injected with 2,4,5-T in diesel oil at a cost of $3·26/acre (for 2·12 man-hours and 0·87 gal.). Two months after treatment most of the injected trees were dying.

3949. LETOURNEUX, C. Les dégagements par annélation et empoisonnement. **[Clearing by girdling and poisoning.]** *Bois For. Trop.* No. 46, 1956 (3–10). 14 refs. [F.]

Discusses the merits of poisoning vs. girdling as a means of killing unwanted trees, and the merits of Na arsenite vs. 2,4-D and 2,4,5-T as a poison. Describes methods of application of poison to trees.

3950. PEEVY, F. A. **Woody plant control in southern forests**. *Proc. 7th ann. Sth. Weed Conf.* 1954 (261–4). 3 refs. O.R.E.

Presents the results of tests of chemical and other means of control, based on research conducted from 1945 to 1953 by the Alexandria Research Centre, a branch of the Southern Forest Experiment Station. On the basis of cost and degree of control, 2,4,5-T ester (16 lb. acid equivalent in 100 gal. diesel oil) applied in frills proved the most effective spring treatment. Ammate crystals applied in 'cups' are best for killing trees < 12 in. d.b.h. in summer and winter, but are more expensive than applying 2,4,5-T in frills. If coppicing is not a problem, 2,4,5-T ester (8 lb. acid equivalent in 100 gal. water) can be applied in frills at all seasons. Trees > 12 in. d.b.h. can be girdled, preferably in spring. Coppicing from stools can be controlled by applying 2,4,5-T ester in oil in winter and spring, and Ammate crystals in autumn. None of the chemicals control coppicing from standing trees in autumn, or from stools in summer. *From author's summary.*

3951. ROBERTS, E. G. **Frilling with and without the application of 2,4,5-T in hardwood control**. *Proc. 7th ann. Sth. Weed Conf.* 1954 (294–6). O.R.E.

The results of experiments in a low-grade mixed hardwood stand suggest that the application of 2,4,5-T to frills does not increase top kill, but does decrease coppicing below the frill, although not eliminating it.

3952. DAVIS, J. R. **2,4,5-T-low-volatile esters effective**. *Sth. For. Notes Sth. For. Exp. Sta.* No. 102, 1956 (2).

Concentrations of 4 lb. and 2 lb. (acid equivalent) of low-volatile propylene glycol butyl ether ester and of the high-volatile pentyl ester gave similar good results against Sweetgum saplings.

3953. ROY, D. F. **Killing Tanoak in Northwestern California**. *For. Res. Note Calif. For. Range Exp. Sta.* No. 106, 1956. pp. 9. 2 refs.

Solutions (1%) of a high-volatile ester of 2,4-D or a low-volatile ester of 2,4,5-T in diesel oil failed to kill when applied as basal sprays, but the vigour of trees frilled and treated with such solutions decreased slowly and the trees will eventually die. Some trees treated with basal sprays began to recover during the fourth growing season after treatment. 2,4,5-T was more effective than 2,4,-D. Sprouts were killed by high- or low-volatile esters of 2,4-D and low-volatile esters of 2,4,5-T, the last being the most effective; sprout clumps were killed more certainly in late autumn than in July or August.

3954. MCCULLY, W. G. **Response of Post and Blackjack Oaks to different volumes of herbicides applied as basal and soil treatments**. *Proc. 7th ann. Sth. Weed Conf.* 1954 (242–4), 4 refs. O.R.E.

Tests were carried out with various volumes and concentrations of low-volatile esters of 2,4,5-T and 2,4-D/2,4,5-T. Within a given concentration, % of kill increased progressively with increased volume of herbicide applied. On the basis of equivalent amounts of herbicide applied per unit stem diameter, higher kills were obtained with a relatively high volume of low concentration than with a lesser volume having a high concentration. Preliminary tests involving injection of the solution into the soil adjacent to the stem, 4 in. below the soil surface, gave good kills of trees 6 in. or less in diam. Oil solutions of 2,4-D and 2,4,5-T gave complete kills at rates of 8 lb. acid equivalent per 100 gal. in volumes based on 60 ml. per in. diam. *From author's summary.*

3955. DARROW, R. A., and MCCULLY, W. G. **Response of Post and Blackjack Oaks to aerial spray applications of herbicides.** *Proc. 7th ann. Sth. Weed Conf.* 1954 (238–41). O.R.E.

Single applications of 2 lb./acre low-volatile esters of 2,4,5-T or 3 lb./acre 2,4-D/2,4,5-T esters in 1 gal. diesel fuel and 3 gal. water gave an average of 30–34% control of Post Oak and 12–19% control of Blackjack Oak. Under favourable conditions control has been as high as 60–80%. Butyl esters of 2,4,5-trichlorophenoxypropionic acid (2,4,5-TP-Silvex) at 1 and 2 lb./acre have given initial defoliation superior to that obtained with 2,4,5-T ester. *From authors' summary.*

3956. MCCONKEY, T. W. **Helicopter application of 2,4,5-T in 1954 to release White Pine reproduction.** *Proc. 10th Ntheast. Weed Control Conf.* 1956 (206–11). O.R.E.

Two dosages were tested in fuel oil at (1) 1 lb./acre, and (2) 3 lb./acre on land burned over in 1947. Overstorey Oaks were very severely damaged with either application. More understorey hardwoods were killed with (2) than with (1). A few of the White Pine were damaged, but all responded to release. Young White and Grey Birch and White Oak were the most susceptible species, Red Maple the most resistant. Some coppicing took place, particularly in Sweet Fern, but this did not greatly interfere with the Pines.

3957. RUSHMORE, F. M. **Beech root sprouts can be damaged by sodium arsenite treatment of parent tree.** *For. Res. Note Ntheast. For. Exp. Sta.* No. 57, 1956. pp. 4.

Preliminary observations in 1950, and a more extensive exploratory study in 1951, both indicated that root suckers of *Fagus grandifolia* can be killed or damaged by treatment of stumps or standing trees through bored holes. In the second experiment on 2 plots, 99 and 74% of suckers were damaged within 11 months of treatment of the parent trees and the method could probably be improved to kill both trees and all root suckers with a single treatment. Seedlings were not damaged.

245. Tending of Trees, Pruning etc.

See also Nos. 3937, 3942, 3980–2, 4013, 4352, 4541.

3958. ZEHETMAYR, J. W. L., and FARQUHAR, J. **Pruning of conifers by disbudding.** *Rep. For. Res. For. Comm., Lond. 1954/55,* 1956 (102–6 + 1 photo). 6 refs.

Gives interim results of a series of experiments. The method has interesting possibilities for Scots and Corsican Pines and possibly even for Norway and Sitka Spruces. After 6 years, the reduction in height growth through disbudding is not severe, though there is a considerable loss in girth increment. Fast-growing Douglas Fir has proved unsuitable for disbudding, owing to the resultant dieback of the leaders.

25. Treatment of Defective, Derelict or Very Open Stands

See also Nos. 3793, 4127.

3959. MILLER, A. D. **Derelict woodland investigations.** *Rep. For. Res. For. Comm., Lond. 1954/55,* 1956 (37–9 + 2 photos.).

Special attention has been given to exploring the most economic method of converting Rhododendron ground into useful forest ground. Cutting strips through it and planting heavy shade-casting conifers (Douglas Fir, *Abies grandis*, and *Tsuga heterophylla*) proved to be initially much cheaper than clear cutting; there is apparently no economic advantage in making the cut strips narrower than about half the height of the Rhododendrons. An investigation is being made into methods of treating hardwood scrub on heavy clays, with comparisons of the costs of clearing by heavy machinery that either (*a*) uproots the scrub, or (*b*) cuts it off at ground level.

26. Combinations of Forestry with Agriculture and Pastoral Husbandry (Including Shelterbelts and Their Treatment)

263. Irrigated Forests

See also No. 3923.

3960. GORRIE, R. M. **Prospects for irrigated forest plantations in Iraq.** *Emp. For. Rev.* 35 (1), 1956 (72–6).

Work in other arid zones is mentioned, including costs, extent, and successful species, related particularly to Changa Manga in the Punjab. Chapman's work at Hawija and at Abu Ghraib farm then receives comment. Successful species are named. The lack of data on water use in Iraq is deplored, but a 15% share of commandable irrigation water is suggested for forestry plantation work. There is a general timber shortage in Iraq; measures to combat this in consultation with FAO are indicated. These measures should include dispersed, irrigated village fuel plantations and also shelterbelts. Species of timber value receive comment, e.g. *Eucalyptus dundasi*, and various Acacias etc., named as likely shelterbelt species. The need for over-all planning is stressed, with careful costing, and there should be no privileged rates for the use of water in forestry operations. *Author's summary.*

266. Shelterbelts, Windbreaks

See also No. 3978.

3961. SØRENSEN, M. Lævirkning. **[Shelter effects.]** *Hedeselsk. Tidsskr.* 77 (3), 1956 (49–59). [Dan.] C.G.B.

Describes briefly, with photographs, different types of windbreak, designated by code numbers indicating degree of density and height, and discusses the amount of shelter obtained at different distances, and the arrangement of windbreaks on a farm or in a farming district.

3962. Caborn, J. M. **Width and cross-sectional profile in shelterbelts.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/11/2, 1956. pp. 7. 6 refs. [Department of Forestry, Edinburgh University.]

Discusses the difficulty of making field studies in Great Britain (absence of shelterbelts, complicated topography etc.) and gives some account of scale-model wind-tunnel studies carried out in Edinburgh. It is concluded that the width/height ratio of a shelterbelt has a significant effect in determining the extent and nature of down-wind shelter, though this effect may not be apparent until the degree of penetrability of the belt falls below a critical value, estimated to be ca. 20%. In the case of the widths above the critical value, the sheltered zone will be restricted, and the unobstructed wind velocity resumed relatively close to the belts. Since the width/height ratio of a belt will decrease with height development until the final height is reached, wide belts will exhibit a relatively lower efficiency index in their early years and one much smaller than narrow belts of similar age and height. The wind-tunnel studies also indicate that a canopy gradient on the windward margin of a belt is similar in effect to an increase in width, i.e. it restricts the extent of the leeward sheltered area to a degree dependent upon the acuteness of the angle of this gradient. An inclined windward edge causes deflection of the major part of the air stream over the top of the windbreak, thus reducing the effective degree of penetrability. The shallower the gradient, the more pronounced is this reduction. This phenomenon may be of advantage in connexion with the protection of forest margins, but where shelter is required near the ground, belts with vertical windward and leeward edges would seem to be generally more effective than designs involving various combinations of windward and leeward canopy gradients. [Cf. *For. Abstr.* 15 (No. 2528); 17 (No. 432).]

3963. Iizuka, H. **On the width of windbreak.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/11/10, 1956. pp. 4. [Government Forest Experiment Station, Tokyo.]

A report on wind-tunnel studies on model trees. [Cf. *For. Abstr.* 14 (No. 3391); 17 (No. 2808).]

3964. Lupe, I. Z. Noi contribuţii la cunoaşterea influenţei perdelelor de protecţie asupra vîntului. **[The influence of shelterbelts on wind.]** *Bul. şti. Acad. Repub. rom.* (*Sect. Biol.*) 7 (4), 1955 (1027–52). 9 refs. [Rum.russ.f.] O.R.S.

Gives the results of research done in 1954 on the effects on wind velocity of newly established shelterbelts (4–5 years old) planted with quick growing species (*Acer negundo*, Robinia, *Prunus armeniaca*, *P. mahaleb*, *Ulmus pumila*, Willows etc.). It is concluded that such belts, when properly disposed, reduce wind velocity by 30–38% for a distance of 250 m. The most efficient belts are those in which penetrability increases from the ground upwards. When the disposition of the belts is incorrect and the wind blows parallel or at acute angles to the direction of the belt, wind velocity may be increased by 5–37% in the middle third of the 'protected' area, while it is lowered in the area immediately adjacent to the belt. A study was also made of the effect of soil microrelief and ground cover on vertical air movement. French legends are given for all graphs etc.

3965. Karschon, R. *Pennisetum purpureum* Schum. comme brise-vent. **[*P. purpureum* as a windbreak.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/11/5, 1956. pp. 5 + 5 gphs. 5 refs. [F.] [Forest Research Institute, Ilanoth.]

Preliminary studies on the effects of windbreaks of *P. purpureum*, ca. 4 m. high, on distribution of precipitation and reduction of wind velocity above protected crops in Israel.

3966. Ničota, B. Influence des rideaux-abris sur l'amélioration de la température de l'air et du sol dans l'intervalle de ces rideaux. **[The influence of shelterbelts on the air and soil temperature between them.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/11/4, 1956. pp. 12 + 9 gphs. 11 refs. [F.g.] [Šumarski Naučno Opiten Institut, Skopje.]

A study was made of the effect of shelterbelts on microclimate at Ovče Polje, on a deforested plain of 20,000 ha. The data are set out in a number of tables and graphs. It is concluded that in the conditions at Ovče Polje, a width of 6 m. is the minimum for belts to exercise a beneficial effect on air and soil temperature. The plan for shelterbelt planting at Ovče Polje (805 km. of belts, occupying 3·85% of the surface area of the plain) is in general approved. The principal belts run E.N.E.–W.S.W. and are spaced 200 m. apart. They are 9 m. wide, with planting at 1·5 × 0·8 m.

3967. Catrina, I., and Marcu, G. Contribuţii la cunoaşterea influenţei perdelelor forestiere asupra umezelii solului în cîmpul vecin. **[The influence of shelterbelts on the soil moisture of adjacent fields.]** *Bul. şti. Acad. Repub. rom.* (*Sect. Biol.*) 7 (4), 1955 (1011–26). 7 refs. [Rum.russ.f.] O.R.S.

Study of soil moisture in fields protected by Robinia belts, compared with that on the open steppe, showed that moisture in protected soil was 1–23% higher. In years of normal precipitation the increased moisture throughout the soil profile (to a depth of 1·4 m.) was 3%, the value being much higher for the surface layers (13% in the 0- to 15-cm. layer) which are mainly utilized by field crops. Graphs etc. have French legends.

3968. Tamate, S. **Influence of windbreak on evaporation.** [*Docum.*] *12th Congr. int. Union For. Res. Organ. Oxford 1956* No. *IUFRO*/56/11/7, 1956. pp. 2. [Government Forest Experiment Station, Tokyo.]

Cf. *For. Abstr.* 15 (No. 286).

3969. Kashiyama, T. **Decrease of sea fog density by a model shelterbelt.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/11/9, 1956. pp. 2. [Government Forest Experiment Station, Tokyo.]

Cf. *For. Abstr.* 13 (No. 1371).

3970. TAMATE, S. **Effect of windbreaks on the decrease of salt content in seawind.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/11/8, 1956. pp. 1. [Government Forest Experiment Station, Tokyo.]
Cf. *For. Abstr.* 13 (No. 3852).

3971. RIEDL, O. Zkušenosti se zakládáním ochranných lesních pásů na jižní Moravě. **[Experience gained in the establishment of forest shelterbelts in southern Moravia.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 28 (2), 1955 (299–314). 9 refs. [Cz.cz.russ.g.]
The results so far obtained (5 years after inception) are not satisfactory. Owing to insufficient preparation of the soil, weeds are still a major problem in many planted shelterbelts. A dense spacing (ca. 9000 plants/ha. compared with the original figure of 4600) has been adopted as more suitable. In view of the soil and climatic conditions (low water-table, high evaporation, low rainfall), only strong plants ≮ 25 cm. high, with good roots, must be used. The 'nest' system of planting was found to be suitable. Fallowing with deep autumn ploughing was found to be the best soil preparation.

3972. HANSEN, F. Fornyelse af læbælter. **[Renewal of shelterbelts.]** *Hedeselsk. Tidsskr.* 77 (5), 1956 (93–6). [Dan.]
Urges the use of a greater variety of species, especially when replacing trees attacked by *Fomes annosus*, and discusses the possibilities of e.g. *Populus* spp., Alder, Birch, and Larch.

268. Pastured Forests. Grazing on Forest and Open Ranges. Forage Plants etc.

See also Nos. 3743, 3803–4, 4079–80, 4119.

3973. ALONSO OLIVÉ, R. E. El pastoreo y los bosques. **[Grazing and forests.]** *Rev. Agric., Habana* 38/39 (1), 1954/1956 (114–28). [Span.] E.M.B.
Reviews types of land used for pasture in Cuba and their possible management. The Pine stands are the only forests that could be rationally managed for grazing. Forage species to encourage under Pine must be those not requiring burning to produce good pasture, e.g. *Melinis minutiflora* and *Andropogon* spp.

3974. **Grazing capacity of South Georgia forest ranges.** *Rep. Stheast. For. Exp. Sta. 1955*, 1956 (60).
A 4-year study in wiregrass/Pine ranges showed that overgrazing reduced weight gains of cattle. Assuming a grass yield of 1060 lb./acre, some 9 acres are needed for 1 young steer from March to January, and 15 acres for a mature animal. A regression formula to guide reductions in grazing incidence for over- and under-storey is presented.

3975. FOURY, A. Les légumineuses fourragères au Maroc. **[The leguminous fodders of Morocco.]** *Cah. Rech. agron., Rabat* No. 3, 1950 (25–317); No. 5, 1954 (288–657). 1215 refs. [F.]
The cultivation, uses, and chemical composition of the important fodders, several woody genera (*Prosopis, Gleditsia, Ceratonia, Leucaena, Dalbergia* and *Cytisus*) being included in a comprehensive list. References number over 1000, and there is a very full index of common and systematic names.

3976. THOMAS, B. **Heather (*Calluna vulgaris*) as a food for livestock.** *Herbage Abstracts* 26 (1), 1956 (1–7). 47 refs.
A review article.

27. Arboreta. Arboriculture for Ornamental Purposes. Hedges and Hedge Plants

See also No. 4541.

3977. KASHIRSKY, K. F. **Landscape gardening in Moscow.** *Trees Mag., Ohio* 16 (3), 1956 (6–7, 23–4).
Notes (with some photographs) on choice, planting, and care of street trees in Moscow. It has been found that the best age for transplanting is 20–30 years. Figures are given for standard dimensions of transplants, distances from walls, roadway, pipes, poles etc.

3978. LEWIS, C. E. **Tips for better landscapes: The use of Japanese Black Pine.** *Amer. Nurserym.* 103 (12), 1956 (10–1, 41).
Recommends the use of *Pinus thunbergii* as an ornamental tree or in shelterbelts by the sea shore.

3979. BRADEN, J. C. **The 'water method' of tree removal.** *Trees Mag., Ohio* 16 (3), 1956 (13).
Notes on a method developed by the Park Department, Cleveland, Ohio, for facilitating the removal of street trees by softening the surrounding soil by introducing water under pressure at several points round the tree a day or two before removal. Three feet of ½-in. pipe are used and pressure up to 700 lb. from a spray truck carrying 400 gal. of water.

28. Husbandry of Forest Products Other than Wood

See also section 892.

281. Christmas Trees

3980. HACSKAYLO, J. **Tree form of Scotch Pine as affected by shearing.** *For. Mimeo. Ohio agric. Exp. Sta.* No. 26, 1956. pp. 5 + 1 plate.
The results of an experiment in trimming 4 + 2 Scots Pine transplants, 1, 2, 3 and 4 years after transplanting, in order to obtain well shaped Christmas trees.

3981. HACSKAYLO, J. **Effect of shearing on terminal elongation in Scotch Pine (Riga strain).** *For. Mimeo. Ohio agric. Exp. Sta.* No. 27, 1956. pp. 2 + 1 dgm.
During the study [see preceding abstract] it was found that the rate of annual elongation of controls increased with age. It was then found, by measuring trees planted in 1930, that the rate of elongation of Scots Pine of Riga strain increased to about the 8th year after transplanting and then tended to decrease until the 20th year, after which the rate became constant. Annual trimming is necessary to produce a compact, bushy tree.

3982. HACSKAYLO, J. **Effects of shearing on lateral stems produced on the main axis of Scotch**

Pine (Riga strain). *For. Mimeo. Ohio agric. Exp. Sta.* No. 28, 1956. pp. 1 + 1 dgm.

The number of lateral branches produced on the main axis of young Scots Pine was greater in the season after trimming. Trimming in June, July or Nov. gave an increase of 65–120%, but trimming in Dec. only a 12% increase over controls.

282. Bark Crops

See also Nos. 4011, 4063.

3983. MÉTRO, A. Alguns aspectos da subericultura em Marrocas. [**Some aspects of Cork Oak cultivation in Morocco.**] *Bol. Junta nac. Cortiça, Lisboa* 18 (209), 1956 (123–31, xxix, 25–32). [Port. F.e.]

Fuller version of a report to the FAO Working Party on Cork Oak [cf. *For. Abstr.* 16 (No. 328)].

283. Fruit and Seed Crops etc.

3984. RADIMIR, D. O značaju uzgoja šumsko-voćnog drveća i grmlja na području NR Hrvatske. [**The importance of growing fruit- and nut-bearing forest trees and shrubs in Croatia.**] *Šum. List* 79 (3/4), 1955 (94–118). 80 refs. [Croat.g.]

Taking into consideration the faulty distribution of forest trees and shrubs bearing edible fruit in Jugoslavia and the average yield of fruit per ha., the author advocates including these species (e.g. *Castanea sativa*, *Corylus avellana*, *Juglans regia*, *Morus alba*, *Ceratonia siliqua*, *Prunus* spp., *Pyrus* spp.) in afforestation programmes.

3985. MAISTRE, J. Le giroflier à Madagascar et Zanzibar. [**The Clove in Madagascar and Zanzibar.**] *Agron. trop.* 10 (4), 1955 (413–48). 17 refs. [F.f.e. span.]

An account of methods of planting, tending, harvesting and marketing cloves.

284. Crops Tapped for Exudations

See also No. 3628.

3986. WISŁAWSKI, M. Proby pozyskiwania suchej żywicy świerkowej. [**Attempts at collecting dry Spruce resin.**] *Sylwan* 100 *A* (1), 1956 (19–28). [Pol.russ.e.]

Describes results of preliminary experiments on 110 *Picea abies* in 1953 and a further 426 (elsewhere) in 1954. Since conventional tapping methods are uneconomical for *P. abies*, a method was developed, consisting in removing thin strips of bark, ca. 150 cm. long, at 5- to 10-cm. intervals, round the basal part of the stem, in May–June and scraping off the dry resin in Oct.–Nov. The trees were 60–100 years old. The 1953 yield averaged 0·63 kg. dry resin/tree, the 1954 yield from 0·21 to 0·33 kg. In view of the low yield and of the fact that resin secretion continued during the second year, it seems advisable to collect the resin every 2 or even 3 years, and so reduce labour costs. Further experiments will determine the question of any deterioration of the wood.

3987. **Turpentining increases the cone crop of Slash Pine.** *Rep. Stheast. For. Exp. Sta. 1955*, 1956 (18).

A count started 1½ years after tapping began and continued for 3 years, showed that the cone crop was 50% greater than that on comparable untapped trees.

3988. HARM, H. Erkenntnisse und neue Wege zur Steigerung der Harzerträge. [**New findings on better resin yields.**] *Allg. Forstztg.* 64 (19/20), 1953 (243–9). 5 refs. [G.g.]

Describes experiments on the selection of potentially high-yielding *Pinus nigra* trees, by measuring the size and number of resin ducts per unit area, and the secretion pressure (judged from speed and duration of flow in relation to duct area), on 3-year-old progeny of mother-trees of known yield. Both qualities were hereditary.

3989. FLOTYŃSKI, J. Z doświadczeń nad wpływem pory spałowania na wydajność żywicy. [**Experiments on the effect on resin yield of the time when tapping starts.**] *Sylwan* 99 (6), 1955 (516–22). 6 refs. [Pol.russ.e.]

Presents results obtained in 1952–53 from > 300 *Pinus sylvestris* trees 80–100 years old. (*A*) Stems with faces prepared in Sept. 1951 were tapped together with controls whose faces were prepared as usual in March 1952, the tapping for both groups lasting from May to Oct. 1952. (*B*) From May to Sept. 1953, 3 groups of stems were tapped with faces prepared in (1) Sept. 1951, (2) March 1952, and (3) March 1953 (controls). In (*A*), the yield from experimental faces (Sept.) was ca. 13% less than from controls. In (*B*), group (1) yielded only slightly less, and group (2) ca. 9% less than controls (group 3).

3990. **New chemicals for prolonging gum flow.** *Rep. Stheast. For. Exp. Sta. 1955*, 1956 (33).

Potassium α-naphthoxyacetate at 20% concentration gave results comparable to 50% H_2SO_4 on Slash Pine. On Longleaf Pine, penetration above the face was excessively high and erratic, and yields progressively declined during the season. The chemical is not recommended. [Cf. *For. Abstr.* 16 (No. 1782).]

286. Osier-Growing

3991. STOTT, K. G. **Cultivation and uses of basket willows.** *Quart. J. For.* 50 (2), 1956 (103–12 + 8 photos).

A general account of conditions suitable for growing basket Willows, species grown, methods of cultivation and harvesting, pests and diseases, processing and marketing, all with reference to the Willow-growing area of Somerset. *From author's summary.*

3992. BUKIEWICZ, H. Sprawozdanie z konferencji na temat uprawy i użytkowania wierzb. [**Report on the conference on the cultivation and utilization of Willows.**] *Sylwan* 100*B* (2), 1956 (43–57). [Pol.]

The following papers presented at the conference (Poznan, 12–14 Sept. 1955), are summarized: (1) Willow problems in Poland (*L. Mroczkiewicz*); (2) Scientific principles of selecting soils for Osier plantations (*K. Staffa*); (3) Problems of Osier cultivation and planting techniques (*H. Bukiewicz*);

(4) Utilization and processing of Osiers (*Z. Zimny*); (5) Chemical processing of Willow wood and bark (*S. Prosinski*); (6) Problems of producing wood as raw material for the pulp-and-paper and osier industry. The conference discussions are included.

3993. Jeżewski, Z. Doświadczenia w dziedzinie uprawy wikliny. **[Experience gained in Osier growing.]** *Sylwan* 99 (1), 1955 (32–44). [Pol.russ.g.]

Trials between 1950 and 1953 in experimental Osier plots in Poland showed that: (1) the optimum thickness of sand cover applied after planting is 5 cm.; (2) thorough screefing in old, exhausted plantations results in higher yields for 3 years afterwards; (3) spring burning (to destroy insects, fungi and weeds) does not lower the yield; (4) a plantation left uncut in the first year after planting gives a greater yield in the second year than the combined yield of one cut in both years. The merits of using K, P, and N fertilizers are discussed.

3994. Jeżewski, Z. Badania nad sztobrami (zrzezami) wikliny. **[Investigations on Osier cuttings.]** *Sylwan* 99 (2), 1955 (135–48). [Pol.russ.g.]

Experiments made in Poland since 1952 have discovered linear relationships between the length of Osier cuttings (10, 15, 20, and 25 cm.), and both the number of surviving plants and the crop yield in the first and second year. It is not expedient to reduce the length from 25 to 20 cm. because the loss in yield far exceeds the economy in original material. Cuttings from one-year-old shoots from stools several years old give a lower survival rate and fewer subsequent shoots than cuttings from one- or two-year-old shoots of new stools. With adequate storage conditions, cuttings from winter-stored shoots give the same results as cuttings from shoots cut in spring. It was found that the yield in the third year was up to twice as great in a plantation that was not cut in the first year as in one where a crop was taken in the first year [cf. preceding abstract].

288. Crops Grown for Animal Products

3995. Nakahara, J., and Kitazawa, S. **[Experiments on rearing the Japanese tussah silkworm (*Antheraea yamamai* Guerin) in coppice Oak.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 76, 1954 (1–13). 9 refs. [Jap.jap.e.]

Contains analyses (for up to 3 seasons, by 5-day periods, up to 60 days from release) of the heavy casualties suffered by this silkworm from abiotic causes and from spiders, insects, and birds.

289.4. Shade Trees for Crops

3996. Lemée, G. Influence de l'alimentation en eau et de l'ombrage sur l'économie hydrique et la photosynthèse du cacaoyer. **[The influence of water supply and shade on the water régime and photosynthesis of *Theobroma cacao*.]** *Agron. trop.* 10 (5), 1955 (592–603). 15 refs. [F.f.e.span.]

Reports studies of moisture requirements and transpiration on potted seedlings, which showed that though shade is necessary to Cacao, particularly during a drought or in a soil with poor field capacity, such shade should be light in order to avoid serious reduction of C assimilation. A list is given of Ivory Coast species suitable for providing such shade.

3. WORK SCIENCE (WORK STUDIES). HARVESTING OF WOOD: LOGGING AND TRANSPORT. FOREST ENGINEERING

30. Work Science (Work Studies): General

See also No. 4031.

302. Man and Work (Physiology and Psychology)

3997. Streef, G. R. **Measurement of the pulse rate in forest work.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/32/6, 1956. pp. 7. 7 refs.

303. Training in Work Science and Efficiency

See Nos. 4002, 4648.

304. Hygiene. Safety. Accidents and their Prevention

See also Nos. 4001, 4013.

3998. Hide, R. H. **Dermatitis from handling conifers.** *Quart. J. For.* 50 (2), 1956 (160).

Instances of acute dermatitis from handling conifer timber have occurred at Dartington. It appears that Norway Spruce needles and Larch sap were the causative agents.

307. Tools, Equipment, Machines and Working Animals: General

See also Nos. 3839, 3867–8, 3870, 3892, 3905, 3911, 3929, 3948.

3999. Handbuch der Forstkultur. **[Manual of forest husbandry.]** Forstkultur, Forstliche Bezugsgenossenschaft e.G.m.b.H., Hamburg-Bahrenfeld. 2nd ed. 1955. pp. 219. [G.] I.F.B.

A classified and illustrated sales catalogue of a forest consumers' cooperative, including machinery, tools, chemicals for fertilizing and protection, instruments, protective clothing etc., with prices.

4000. **Equipment news.** *Unasylva* 10 (1), 1956 (42–4).

Includes illustrated notes on the Le Tourneau 'Tree crasher' for uprooting heavy and large trees, the 'Homelite' brush-cutter attachment for converting a chain saw into a brush-cutter, the Schulstad mobile circular saw, and the Ruddan cant hook.

31. Logging and Transport: General

See also Nos. 4360, 4371–2, 4456, 4483, 4616.

4001. CARR, G. J. **Developments in logging—1955 [in the U.S.A. and Canada.]** *For. Prod. J.* 6 (2), 1956 (41–8). 95 refs.

An illustrated review of new developments in all phases of logging operations (timber cruising, job lay-out, road-building, felling, bucking, yarding, loading, hauling, communications, and safety measures). A bibliography of N. American literature on logging is appended.

4002. Numéro spécial sur la mécanisation de l'exploitation forestière. **[Special number on the mechanization of logging operations.]** *Rev. for. franç.* 8 (6), 1956 (385–468 + 15 photos). [F.]

Includes the following articles: The mechanization of logging operations—difficulties and solutions (*J. Venet*); Mechanization in felling and primary conversion (*H. Duteil*) (gives some data from time studies on the use of motor brushcutters, power saws, and mechanical barkers); Can the forestry tractor be an agricultural tractor? (*X. de Mégille*) (discusses the peculiar requirements of agriculture and forestry, decides that in fact the agricultural tractor is employed for 60% of the time in transport, and that designers have not sufficiently considered this, and concludes that there is room for an all-purpose tractor with 4-wheel drive, interchangeable wheels and tracks, of semi-trailer type, and with a set of trailers, at least one of which should have driving wheels); The training of forest workers (*R. Kobloth*); and Inter-communal syndicates and mechanization (*L. Badré*) (discusses preliminary results from the newly formed French 'Syndicats de gestion forestière' for the management of fragmented communal holdings).

4003. TUFFIER, M. La Compagnie Commerciale de l'Afrique Équatoriale Française. **[The Compagnie Commerciale de l'Afrique Équatoriale Française.]** *Bois For. Trop.* No. 46, 1956 (17–28). [F.]

The company is one of the oldest and most important forestry businesses in Gabon, exploiting 140,000 ha. Methods of exploitation are described, with detailed description of the equipment used for felling, loading, unloading, skidding and hauling.

32. Felling and Related Operations

322. Felling Season. Preparatory Measures

4004. HOLMES, G. D. **Experiments in the poisoning of standing trees to facilitate bark peeling of felled logs.** *Rep. For. Res. For. Comm., Lond. 1954/55*, 1956 (119–26 + 2 photos). 12 refs.

The trials discussed are a preliminary series on methods of facilitating bark removal by killing trees chemically before felling and peeling. Various poisoning techniques were compared for Corsican Pine, Japanese Larch, and Douglas Fir, using Na arsenite or NH_4 sulphamate. Na arsenite in 40% (As_2O_3) equivalent solution, applied to band girdles in late spring, was found to facilitate bark peeling in autumn and spring following treatment, except with Douglas Fir. Treatment also considerably reduced the weight of wood per unit volume. NH_4 sulphamate, $NaClO_3$, Na 2,4-D, and Na 2,4,5-T proved much less effective in assisting bark removal. Band girdles 3–6 in. wide, painted with the toxic solution, proved the most effective and convenient method of application. Douglas Fir was most difficult to kill, and only showed loosening of bark after application of impractical quantities of Na arsenite. No serious insect or fungal attack was observed on treated trees. The toxic hazards of using Na arsenite, and the effect of residual As on utilization and on the surrounding crop are discussed. The technique holds considerable promise and is now under test in a large-scale costing trial on conifers. It is also being examined for application to hardwoods. *From author's summary.*

4005. RUSHMORE, F. M. **The frill: a new technique in chemical debarking.** *J. For.* 54 (5), 1956 (329–31).

The usual method of application of Na arsenite for promoting easy barking, is by band-girdling and painting on to the bare wood. Experiments at the Adirondack Research Centre have shown that a simple frill made with axe-cuts is just as effective as a complete band girdle and costs less. Experiments are in progress to develop a syringe, instead of a brush, for applying poison to the frill.

4006. WILCOX, H., CZABATOR, F. J., GIROLAMI, G., MORELAND, D. E., and SMITH, R. F.; WEBB, W. L., ROSASCO, E. M., and SIMKINS, S. V. R. **Chemical debarking of some pulpwood species with a section on the effect of chemical debarking on forest wildlife.** *Tech. Publ. N.Y. St. Coll. For.* No. 77, 1956. pp. xi + 43. 43 refs. Price $0·60.

Reports the results of 4 years' work on a co-operative project between a group of pulp and paper companies (Chemical Debarking Research Project) and the State University of New York. Results are given of research on the physiology and anatomy of treated and untreated trees, the distribution and retention of the chemical (different forms of Na arsenite) in the wood and bark of treated trees, and on problems encountered in forest and wildlife management in connexion with the toxicity of the chemical. The practical and economic advantages of chemical barking are taken to be proved, and recommendations are made for care in handling the poison so as to minimize its disadvantages. Tabulated data are given on the following: peeling class of As-treated trees; effect of different As concentrations and compounds and the use of repellents, stickers etc.; peeling classes of different species; effect on peelability of girdle width and scoring the sapwood; cause of live strips in treated trees; As content of pulps from treated trees; animals found dead on chemical-debarking areas; As content of leaves, needles and twigs of treated trees; and leachable As in chemically barked Spruce pulpwood.

4007. SCHMIDT, O. A. **A study of lumber grade recovery from chemically girdled Red Oaks.** *J. For.* 54 (4), 1956 (243–5). 7 refs. [School of Forestry, Pennsylvania State University.]

Twenty Red Oaks (*Q. coccinea* or *Q. rubra*) were band girdled and poisoned with Na arsenite in June.

At weekly intervals into September, a pair of these with a comparable pair of controls were felled and milled, and the topwood cross-cut for pulpwood bolts. It was concluded that after chemical treatment these species should be sawn within 2 weeks to avoid stain and ambrosia beetle; if left standing 3 or more weeks, the degrade varied from 0·45% in No. 3A Common to 90% in F and S grades. The topwood of trees felled 7 or more days after chemical girdling can be barked whether cut into bolts or left intact at the time of felling. Slabs from trees left standing at least 4 weeks after poisoning are easily barked.

323. Felling and Subsequent Primary Conversion

See Nos. 4009–14.

326. Sequence of Operations (Including Felling Instructions, Primary Conversion after Extraction, Composition of Gangs, One-Man Work etc.)

See also No. 4024.

4008. Begley, C. D. **Seasoning before extraction: a study of its effect on extraction times.** *Rep. For. Res. For. Comm., Lond. 1954/55*, 1956 (106–11).

In 1952, experiments were begun to see what happened to pole-size trees left to season at stump after felling, and to determine whether extraction of these poles was markedly easier than the extraction of fresh-felled ones. The results of the extraction trials are discussed and the effect of seasoning on peeling is also considered. Although the time taken to extract the seasoned poles to ride-side was shown to be less than the time for extraction of unseasoned poles, the time expended in stacking the poles that were to be seasoned at stump equalled any time saved on extraction of seasoned poles. In the conditions of this study the rate of peeling was unaffected by seasoning. The studies on degrade, natural loss of bark, and insect and fungal damage are not yet completed.

33. Degree of Utilization and Waste. Clearing the Felling Site. Harvesting of Small Wood

See Nos. 3572, 3807, 3935, 4014, 4024, 4096.

34. Storage in the Forest and at Log Dumps

See Nos. 4008, 4017–9, 4027.

35. Performance Measurements for Determining Piece Rates in Felling and Related Operations

4009. Hilf, H. H. Leistungsuntersuchung und Leistungsverwirklichung im Hauungsbetrieb. **[Performance analysis and achievement in logging work.]** *Forst- u. Holzw.* 11 (12), 1956 (251–5). [G.]

A report on investigations carried out by the Institute of Forest Work Studies at the request of a Forest Workers' Union, to check the adequacy of the North German logging tariff, in force since 1946, and proposals for a revised tariff, with discussions on theoretical concepts such as 'normal' or 'average' performance and rest periods.

4010. Puhane. Die Durchschnittsleistungskurve für Buchenendnutzungen. **[A graph of mean times of production [of sawlogs and cordwood] in main fellings of Beech.]** *Allg. Forstztg.* 64 (1/2), 1953 (18–9). [G.]

A graph, based on time studies under normal summer and winter conditions in the Wienerwald, plots mean times/cu.m. over mean diameters of stand, for sawlogs and cordwood separately.

4011. Hilscher, A. Zeitbeobachtungen bei der Gewinnung von Fichten-Lohrinde. **[Time studies on the harvesting of Spruce tanbark.]** *Allg. Forstztg.* 64 (11/12), 1953 (138–9). [G.]

Times are recorded for barking 1 cu.m. of wood in 1·6- or 1-m. lengths of bark by log diameter classes (mid-point measurement), and for rolling up stacking and transporting the bark per cu.m. of rolled bark. Working methods and tools are described.

36. Tools, Machines and Equipment for Felling and Related Operations

See also Nos. 3945, 3999, 4000–3, 4541.

4012. **Machinery and equipment.** *World Crops* 8 (2), 1956 (90–2). O.R.E.

Includes descriptions and illustrations of an electric hand chain-saw produced by Tarpen Engg. Co. Ltd., capable of felling trees up to 7 ft. in diameter, and of a portable winch, powered from chain-saw motors, produced by J. Clubley Armstrong Danarm Ltd., London.

4013. Puckett, B. P. **Use of the chain saw in the tree.** *Proc. nat. Shade Tree Conf. 1955*, 1955 (168–74).

Discusses the use of chain saws for trimming or pruning ornamental trees, windbreaks etc., with particular reference to safety measures.

4014. **Advanced designs in land-clearing equipment.** *World Crops* 8 (4), 1956 (137–41). O.R.E.

Describes and illustrates root cutters, tree cutters, treedozers, stumpers, rakes, cutters and choppers etc.

4015. Sakaguchi, K. **Bush cleaner and tree climbing tool.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford* No. *IUFRO*/56/23/7, 1956. pp. 1 + 1 photo + 2 drawings.

Describes: (1) a brush cutter consisting of a circular saw-blade attached to a long handle and driven by a 2-cycle, 1·2-h.p. petrol engine; (2) a traditional climbing device, the 'Buri-rope', consisting of a rope with a wooden stick attached at each end. One stick is fixed at head height, with a hanging loop to form a step, and the climber, having reached this step, draws up the other end and repeats the process. An essential point is the use of knots or hitches that can be shaken loose.

37. Transport

See also Nos. 4001–3.

371. Loading and Unloading

4016. **Recent production figures on mechanical hauling compiled by the Woodlands Section Mechanical Hauling Committee.** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 1478 (*B–8–e*), 1955. pp. 10.

Consists of tabulated data from a survey of methods used by members of 1953 and 1954, showing, for different lengths of timber and hauling equipment, length of haul, load, speed, output per day and number of men, loading and unloading equipment, output and crew size and working time per day.

4017. GADENZ, K.; HAFNER, F. Praktische Fragen der forstlichen Lade- und Lagerungstechnik. **[Practical problems of loading and storing.]** *Allg. Forstztg.* 65 (1/2; 5/6; 9/10; 17/18; 21/22), 1954 (14–5; 71–4; 137–8; 222–3; 270–1). [G.]

Describes and illustrates a number of hand and motor winches, cranes for motor or animal power, loading ramps, hydraulic lifting equipment etc., including some simple devices for lifting logs by hand power.

4018. **Log grapples do the job better.** *Lumberm.* 83 (5), 1956 (73–7, 127 . . . 133).

Illustrates and discusses the use of grabs, mounted on cranes or booms, for loading, unloading and piling logs, and some accessories; lists U.S. manufacturers with a brief description of their products.

4019. **Novel timber handling device. Advantages claimed over conventional type of wire rope sling.** *Timb. Tr. J.* 217 (4154), 1956 (117).

Intended for the unloading and stacking by derrick or crane of hardwood in sticks and of sawn softwood delivered from barge, ship, or lorry, the device consists of 2 'forks' like those of a fork-lift truck and a pneumatically operated gate which is raised to allow the forks to slip under the load.

372/377. Land Transport

See also Nos. 4008, 4012, 4016.

4020. MEYR, R. Rückung und Nahförderung des Holzes unter Verwendung von Forstseilwinden. **[Short-distance transport of wood with cable winches.]** *Allg. Forstztg.* 65 (5/6), 1954 (62–4). 3 refs. [G.]

Describes the use of cable winches for skidding either on the ground or on simple skidways, and more particularly, transport with the 'Mariabrunner Kleinseilkrangerät' (small skyline crane), less elaborate than the Wyssen and designed for short distances only. Average hourly performance over a 190-m. haul was 2·8 cu.m.

4021. Seilförderanlagen im Gebirgsforst. **[Cable installations in mountain forests.]** *Allg. Forstztg.* 65 (17/18), 1954. pp. 27. [G.]

A special number containing the following articles: Forest cableways in Switzerland and France (*R. Meyer*); Load-lowering devices on skyline cranes (*R. Pestal*) (of the models described, the Wyssen is considered best, but all have inherent drawbacks and dangers); New developments in cable installations in Carinthia (*F. Hafner*) (describing chiefly the Gosch electrical system, and the Hinteregger winch and skyline crane); Multiple carriages on single-line cableways (*J. Kastner*) (discussing performance costs and loading techniques); Report on the Kernhof yarder (*E. Hansel*) (also with performance data). There are numerous photographs.

4022. PESTAL, E. **The transportation of wood by long skylines.** *Transl. Fac. For. Univ. B.C.* No. 15, 1955. pp. 9. Condensed translation by D. Mueller-Dombois and F. M. Knapp from *Zbl. ges. Forst- u. Holzw.* 72 (1), 1953 (31–46).

Discusses the Wyssen, Doppelmeyer, and Büko-Universal cableway systems.

4023. NAIDU, K. K. **The Wyssen skyline crane in the Andamans.** *Indian For.* 82 (3), 1956 (116–21 + 4 photos). 3 refs.

Describes the system, its installation, and successful use in extracting timber from steep slopes in the Andaman Islands.

4024. STEINLIN, H., and WETTSTEIN, R. Full-tree logging in Laubholz-Durchforstungen am Steilhang. **[Full-tree logging in thinning hardwoods on steep slopes.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/32/3, 1956. pp. 5. 12 refs. [G.]

Describes the extraction of whole trees by Wyssen cableway, with times for the various stages of the work.

4025. LOACKER, H. Der Nesler-Langstreckenseilkran. **[The Nesler long-distance sky-line crane.]** *Allg. Forstztg.* 65 (5/6), 1954 (65–6). [G.]

A modification of the 'Wyssen', featuring 2 stopping devices. They are said to be easier to move than those of the 'Wyssen'.

4026. VIT, R. **Hauling by cableway Baie at Comeau and Franquelin, Que.** *Pulp Paper Mag. Can.* 57 (4), 1956 (160–2). (*Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 1546 (*B*–8–*a*).)

Gives details of the methods and costs of constructing and operating a tri-cable system for hauling pulpwood, readily set up and dismantled. Three feeder lines of the 'Lasso' type are to be incorporated for stockpiling against bad weather and to provide loads for the night-shift.

4027. VETTER, J. Emploi du skyline pour la manutention des grumes sur parc. **[The use of skyline cables for handling and conveying logs on the storage site.]** *Bois For. Trop.* No. 47, 1956 (26–30). [F.]

Describes the use of an American skyline system in a timberyard in Cameroun.

4028. STÜRTZEL, H. Motorisierte Abfuhr auf Wegen mit Gefälle bis zu 50%. **[Mechanized downhill transport on tracks with gradients reaching 50%.]** *Allg. Forstztg.* 65 (21/22), 1954 (270–1). [G.]

Describes a 'groundbrake' of Austrian invention said to be capable of stopping and regulating the progress of heavily loaded sledges on steep tracks, regardless of ground conditions (e.g. ice). A system of spindles and bearings, operated by hand through a crank, presses a set of six steel braking pins into the ground. The cost is given as Sch.4200 (about £60).

4029. DZIUBAK, W. Dwukółka IBL ciężkiego typu. **[A heavy-duty IBL sulky.]** *Sylwan* 99 (3), 1955 (281–3). [Pol.]

Illustrated description of a prototype of a 3-ton sulky (up to 85-cm. log diam.) to be drawn by 2 horses.

4030. Achilles, H. Neuartige Vieltransportkarre. **[A novel multipurpose hand-cart.]** *Wald* 3 (7), 1953 (212–3). [G.]

Illustrated description of a 2-wheeled rubber-tyred hand-cart with a logging-arch axle carrying a pair of spike hooks. This arch, and a similar shaped piece hinged to its ends, can be turned down and locked by the bent pulling shaft into a rigid horizontal frame, so as to carry cordwood or a large tool-box.

4031. Mégille, X. de. **Tractors for logging.** *FAO For. Developm. Pap.* No. 1, 1956. pp. 189. 146 refs. Price $2·00 (10*s*.).

This paper has been purposely restricted to hauling. Part I discusses the factors determining the organization of logging work (physical conditions, economic conditions, psychological aspects); Part 2 deals with tractors and their equipment in general (method of calculating the output of hauling equipment, and current techniques for hauling timber by tractor); Part 3 discusses the determination of costs and their application. [Cf. *For. Abstr.* 15 (No. 2578).]

4032. Mégille, X. de. **Forestry criteria and equipment of tractors. (Second report.)** Joint Committee on Forest Working Technique and Training of Forest Workers, Geneva. No. *FAO/EFC/LOG/* 28, 1955. pp. 74. Obtainable from the Sales Section, European Office of the United Nations, Geneva, price: *Swiss Fr.*2·75 ($0·70; 5*s*.).

A report based on a questionnaire to member countries [cf. *For. Abstr.* 15 (No. 2578)]. Includes chapters on: general characteristics of tractors used in the forest; engines; transmission; winches; miscellaneous equipment.

4033. Kingston, G. L. **Problems and solutions with large crawler tractors.** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 1565 (*B*–8–*f*), 1956. pp. 11.

A report by the Association's tractor committee after a questionnaire on users' complaints and discussions with agents. The problems, the industry's solution and the makers' action on the advice given, are stated in detail for Allis-Chalmers, Caterpillar and International Harvester.

4034. Czereyski, K. Proba przydatności do zrywki drewna niektórych typów ciągników. **[Tests of the suitability of some tractor types for timber skidding.]** *Sylwan* 99 (3), 1955 (277–81). [Pol.]

Presents the results of preliminary tests with 2 tractors of Polish manufacture (a wheel-type agricultural tractor and a half-track tractor), and 2 tractors of foreign make (FIAT-55L, and the Czech ZETOR SUPER 'P').

4035. Es. Die Allzweck-Seilwinde 'Marso'. **[The all-purpose 'Marso' winch.]** *Holz-Zbl.* 82 (53/54), 1956 (669). [G.]

Describes and illustrates a cable winch with a pair of drums that can be quickly fitted to the rear axle ends of any lorry after uncoupling the wheels and attaching a special braking device. Control is by a pneumatic system installed behind the cab. The winch is particularly useful for rescuing vehicles that have left the road or got stuck, and a special anchor is supplied for this purpose, but it is also suitable for hauling logs and loading.

378. Water Transport

4036. Siiriäinen, E. A. Puutavaran jäävarastoinnista. **[Storage of timber on ice.]** *Metsät. Aikak.* 1956 (2/3), (55–6, 59). [Fi.e.]

In view of the benefit gained from storing timber for spring floating on lake ice as well as on the shore, the author suggests the following procedure for strengthening the carrying capacity of the ice. Holes are bored through, and the difference between the water level in the hole and the surface of the ice is measured. The carrying capacity of the ice in metric tons/ha. is equivalent to this difference in cm. multiplied by 80. The ice is then thickened to the necessary carrying capacity by flushing off the insulating layer of snow by motor pump. For effective results the pump must deliver ≮ 2000 litres per minute.

4037. Gadenz, K. Trift im Lesachtal. **[Timber driving in the Lesach valley.]** *Allg. Forstztg.* 64 (15/16), 1953 (197–8). [G.]

An illustrated account of the working methods and installations on the river Gail in Carinthia.

4038. Kivela, A. **'Valmet' flow developer.** *Pulp Paper Mag. Can.* 57 (5), 1956 (207 . . 213). [Finnish Board of Forestry, Helsinki.]

Lists the specifications of 5 models and discusses generally their use and performance in driving and in melting ice, and the theory and practice behind their construction. The wages item in floating costs has been considerably reduced by their use.

4039. **Artificial waterflow.** *Timber of Canada* 17 (3), 1956 (25–6).

Notes are given on the Finnish-made Arvo Flow developers. Model 3.3B [3–E?] weighs 130 lb. and develops a flow of 130–165 ft. with an electric motor. Model 15-E, also electric, weighs 2050 lb. and delivers a flow of 650–800 ft. Model D-20 delivers the same flow from an air-cooled diesel engine. The first is suitable for sorting logs in still water where space and portability are chief factors. [Cf. *For. Abstr.* 15 (No. 2589).]

38. Forest Engineering

See also No. 4636.

383. Roads and Bridges

4040. Huggard, E. R. **Forest road construction: some notes on constructing curves on side slopes and on the extra width necessary on curves.** *Quart. J. For.* 50 (2), 1956 (137–41).

Tables are given to show the quantity of excavation necessary, for curves of 45 ft. and 60 ft. radius on different slopes.

4041. LUBISCH. Betonspurbahnen als moderne Holzabfuhrstrassen. **[Concrete tracks as modern forest roads.]** *Holz-Zbl.* 82 (72), 1956 (911–3). 3 refs. [G.]

Various methods of constructing new roads and repairing existing ones, based on the principle of 2 firm concrete wheel-tracks, ca. 80 cm. wide, built into a less durable road surface, are described. Experiments on the few existing prototypes, some with gradients of 12%, have been favourable as to cost, load-bearing, frost- and water-resistance, and maintenance.

4042. Forstlicher Strassen- und Wegebau. **[Forest road and track building.]** *Allg. Forstztg.* 65 (3/4), 1954 (21–56). [G.]

A special number, containing articles on the science of vegetation as a basis for road-building (*E. Aichinger*); improved earth roads (*J. Duhm*) (dealing also with chemical stabilizers such as sulphite wastes); Roadside problems (*R. Prückner*) (including planting); and The mechanization of forest road-building (*F. Hafner*) (with data on—chiefly German and Austrian—graders and other equipment).

4043. BROCK, R. M. **Stabilization for forest truck roads.** *B.C. Lumberm.* 40 (5), 1956 (20 . . . 26). 5 refs.

Describes field tests for soil analysis and the methods used to estimate the amount and nature of material to be added in constructing stabilized roads (i.e. roads of natural soils with additions necessary to give abrasive resistance and shear strength sufficient to withstand normal traffic even in severe weather).

384. Protective Works

See also section 116 and No. 3920.

4044. AEBI, F. Die Verwendung von Drahtseil-Netzwerken neuester Konstruktion in der Lawinenverbauung von Riemenstalden. **[The use of cable mesh barriers of new design in avalanche control at Riemenstalden.]** *Schweiz. Z. Forstw.* 107 (4), 1956 (268–78). 2 refs. [G.f.]

The barriers are composed of light-weight triangular-net sections, each 6 m. long at the base, supported by tubular steel poles fixed to base plates by mobile joints. Thus an equalization of pressures over large areas is possible. The barriers are suitable for the initial protection of afforested areas.

4. FOREST INJURIES AND PROTECTION

See also No. 3778.

4045. GRYSE, J. J. DE. **Forest pathology in New Zealand.** *Bull. N.Z. For. Serv.* No. 1, 1955. pp. 62 + 12 photos. 50 refs.

The author, a Canadian entomologist, was engaged by the New Zealand Government in 1953 'to furnish a comprehensive report and recommendations on the essential measures and practices to adopt to safeguard the country's exotic forests from the threat of insect and pathological epidemics'. The report is divided into five parts: I. The problem. II. General principles (surveys, fundamental research, control, organization). III. Specific recommendations (laboratory and auxiliary structures, surveys, notes on a survey of forest fungi, note on methods of recording data, fundamental research, control, organization). IV. Training and recruiting of personnel. V. Co-operation (Forest Service, industry, universities and scientific institutes, other Government departments, Cawthron Institute, general public). The vulnerability of New Zealand stands of exotic Pines is stressed—monocultures, maldistribution of age classes, bad siting, lack of much-needed silvicultural treatment, constitute an ideal background for the development of epidemics of leaf-eating or wood-boring insects that may be introduced from abroad or change their feeding habits.

41. General Technique of Forest Protection. Types of Injury

414. Chemical Control

See also sections 441, 443 and 453.

4046. MURRAY, A. **Britain aids the fight against pests.** *New Commonwealth* 31 (1), 1956 (17–21). O.G.

Includes notes on, and photographs of, the 'Motoblo' shoulder-mounted sprayer designed by Kent Engineering and Foundry Ltd., Maidstone (35 lb. empty, 1½-h.p. engine); the 'Dustejecta' (Drake & Fletcher Ltd., Maidstone) for applying powdered chemicals; the 'Argo' mist sprayer for coffee spraying; a rotary atomizer designed by Micron Sprayers Ltd.

4047. WILDE, S. A., and PERSIDSKY, D. J. **Effect of biocides on the development of ectotrophic mycorrhizae in Monterey Pine seedlings.** *Proc. Soil Sci. Soc. Amer.* 20 (1), 1956 (107–10). 4 refs. O.R.E.

Describes and illustrates the effect of certain chemicals, e.g. chlordane, BHC, thiram, or Stoddard solvent, on the internal and external development of mycorrhizal short roots of *Pinus radiata* seedlings, grown from seed in sandy, siliceous nursery soil that had been treated with these preparations after inoculation with mycorrhizal fungi.

4048. WILDE, S. A., VOIGT, G. K., and PERSIDSKY, D. J. **Transmitted effect of allyl alcohol on growth of Monterey Pine.** *For. Sci.* 2 (1), 1956 (58–9). 3 refs.

A Pine forest soil, infected naturally with the mycorrhiza fungus *Cenococcum graniforme*, was treated in pots at low rates with Thiosan [thiram-type], chlordane and allyl alcohol, the last at 50 gal./acre. Seed of *P. radiata* was sown in the pots 14 days later and the seedlings transplanted at 6 months into pots of prairie soil of high organic content which had never supported forest. This was to test the effect of soil treatments on mycorrhizal fungi. Eight months later the seedlings derived from the soil treated with the allyl alcohol, which had only sparse development of mycorrhiza, were about 7 times the weight of those from any other treatment including the control. This inexplicable and unprecedented development is discussed without any conclusions.

42. Injuries from Inorganic Agencies other than Fire

421. Air Currents

See also Nos. 3587, 3741, 3914, 3932, 4302.

4049. GRATKOWSKI, H. J. **Windthrow around staggered settings in old growth Douglas-Fir.** *For. Sci.* 2 (1), 1956 (60–74). 21 refs.

Wind damage in 400-year Douglas Fir/Western Hemlock/Western Red Cedar after patch logging is analysed with maps, photographs, diagrams and statistical tables, and comprehensive recommendations on methods of avoiding it. The area lies in the Cascade Mts. with conditions similar to those already noticed [see *For. Abstr.* 15 (No. 351)].

422. Temperature Influences. Frost. Heat. Drought

See also No. 3575.

4050. FERGUS, C. L. **Frost cracks on Oak.** *Phytopathology* 46 (5), 1955 (297). 2 refs. [Department of Botany and Plant Pathology, Pennsylvania State University, University Park, Pa.]

A detailed study of the length, orientation, height etc., of frost cracks in 577 Oaks (*Q. alba* and *Q. coccinea*) in a 10-acre wood of 969 trees.

4051. POMERLEAU, R., and RAY, R. G. **Occurrence and effects of summer frost in a conifer plantation.** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 1504 (*F*-1), 1955. pp. 7 + 8 tbls. (Appendix *E* of *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 1505 (*F*-1).)

Abandoned farm land in the Valcartier Experimental Station, Quebec, planted in 1933–40 with (*a*) Red and (*b*) White Pine [*P. resinosa* and *P. strobus*] on a site without air drainage, began to show in 1946 extensive mortality with foliage dying everywhere in the zone 4–5 ft. above ground. In the plots observed, the more susceptible was (*a*) with 71% of 10,000 plants dying, while (*b*) lost 37% of 15,000. Faster-growing individuals pushed up out of the zone and survived, proving that soil conditions were not entirely responsible [cf. *For. Abstr.* 17 (No. 4057)]. Scots Pine appeared only slightly affected, but signs of summer frost injury were seen on Balsam Fir, Larch, Spruce, and even herbs and mosses. Norway Spruce remained bushy, an effect probably ascribable in part to mineral deficiencies. All likely causes of these deaths were examined and it is concluded that summer frost is the cause. Poplar, Birch and Jack Pine nurse crops are suggested for such areas. Growth and microclimatic details are tabulated.

4052. PARKER, J. **Drought resistance in woody plants.** *Bot. Rev.* 22 (4), 1956 (241–89). 11 pp. of refs. [Department of Biological Sciences, Univ. of Idaho, Moscow, Idaho.]

A critical review of world literature on the subject, under the main heads: historical background, problems of approach, and factors contributing to drought resistance (desiccation resistance, and features of roots, stems and leaves).

4053. **Leaf scorch of shade trees.** *Control Plant Diseases, Agricultural Extension Service, Purdue University, Lafayette, Indiana* No. *Mimeo BP*-2-4, 1956. pp. 2.

Revision of an earlier bulletin. Leaf scorch is common on Maples on the side of the tree exposed to sun or drying winds, and is caused by failure of the tree to supply a sufficient amount of water to the leaves at a critical time. Careful pruning and application of fertilizers reduced injury in ornamental trees.

423. Precipitations

4054. PFEFFER, A. O vzniku sněhových polomů v lese. **[Origin of snow breakage in forests.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 28 (3), 1955 (315–24). 13 refs. [Cz.cz.russ.f.]

Analyses breakage in Spruce when their crowns are loaded with snow, assuming their behaviour to conform to Euler's formula for the compression of a rod with a free top end. It is found, e.g., that a stem 22 m. high, d.b.h. 22 cm., and crown length 7·1 m., on a third-class site, is most likely to break under load at a height of ca. 6 m. A table gives the permissible crown load for Spruce 30–120 years old (12–36 m. high, 9–46 cm. d.b.h.), assuming breakage height to be ¼ of the stem height. In Pine, breakage occurs in the upper portion of the stem. Young broadleaved trees are usually uprooted. Highest resistance to snow breakage is found in stems with high crowns, large d.b.h. and narrow uniform growth rings; the older the stem, the greater is its resistance to snow-breakage; with Spruce, the danger from wet snow lasts up to ca. 50 years.

424. Soil Conditions. Erosion Effects. Nutrient Deficiencies etc.

See also Nos. 3706, 4197, 4259.

4055. TRAUNMÜLLER, J. Hochwasserschäden in den oberösterreichischen Donau-Auen. **[Flood damage in the Danube bottomlands of Upper Austria.]** *Allg. Forstztg.* 65 (21/22), 1954 (267–8). [G.]

In the exceptional floods of July 1954, Poplars showed themselves the most resistant species, followed by Willows. Both kept their leaves even after submersion. Elder suffered most. 10% of Lime and Ash and 50% of Maple (transplants) died. Grey Alder, though first losing its leaves, recovered well. Where forest protection of banks was lacking, fast-moving water did great damage to plantations, agricultural land, and soil in general. Poplars again proved very resistant to breakage and uprooting, except when staked.

4056. **[Molybdenum in plant and animal nutrition, its deficiency symptoms and their occurrence.]** *Soil Sci.* 81 (3), 1956 (159–258). 392 refs.

The whole number is devoted to molybdenum. There are 16 coloured plates illustrating deficiency symptoms, and a bibliography of 392 items. Horticultural and field crop plants are chiefly affected.

Hibiscus, *Prunus*, *Citrus* and Cacao have all revealed symptoms. Some peat soils and forest litters carry high, and some pastures poisonous, levels of Mo. Special value is attached to its role in nitrate fixation and reduction in Leguminosae.

4057. LINTEAU, A. **Addition of potassium and magnesium to Red Pine and White Spruce plantation on sand plains at foot of Pinkey Mountain, Valcartier Forest Experiment Station.** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 1505 (*F*-1) Appendix *C*, 1955. pp. 2.

When a 5-year Red Pine plantation died in this frost pocket, frost was considered to be the direct cause. White Spruce and Red Pine were planted in 1952–53. As the levels of Mn and K were low in this poor sand, these were added to certain plots in 1954. A Spruce mortality of 25% in 1954 was attributed to drought, low fertility and transplanting shock. The fertilized plots, however, suffered only 1·7–3·8% casualties, the lower value where both Mn and K were applied. [Cf. *For. Abstr.* 17 (No. 4051).]

4058. **Pin Oak chlorosis.** *Control Plant Diseases, Agricultural Extension Service, Purdue University, Lafayette, Indiana* No. *Mimeo BP*-2-3, 1956. pp. 2.

Revision of an earlier bulletin. The most effective and lasting soil treatment for correction of chlorosis of *Quercus palustris* is by application of $(NH_4)_2SO_4$ at 10 lb./1000 sq. ft., or $Al_2(SO_4)_3$ at 5 lb./1000 sq. ft., or sulphur at 25 lb./tree, applied annually and well watered in. Spraying or injection with $FeSO_4$ obtains a quick response from young trees.

425. Chemical Influences (Atmospheric)

4059. ZIMMERMAN, P. W. **Chemicals involved in air pollution and their effects on vegetation.** *Professional Paper, Boyce Thompson Institute for Plant Research, Inc., New York* 2 (14), 1955 (124–45). 33 refs.

Deals mainly with agricultural and garden crops, but includes some information on trees. A *Pinus* sp. has proved susceptible to HF gas, and *Ailanthus* sp., *Acer* sp., *Tilia americana*, *Cornus* sp., *Ulmus* sp., *Fraxinus* sp., *Liquidambar* sp., *Tsuga* sp., *Quercus* sp. and *Pinus strobus* to Cl gas. A *Quercus* sp. was among malformed plants collected near a factory manufacturing 2,4,-D preparations.

4060. HÄRTEL, O. Eine neue Methode zur Erkennung von Raucheinwirkungen an Fichten. [**A new method for the diagnosis of smoke damage to Spruce.**] *Zbl. ges. Forst- u. Holzw.* 72 (1), 1953 (12–21). 11 refs. [G.g.]

Describes a method of measuring the turbidity of Spruce-needle extracts as a means of early diagnosis of smoke damage and of ascertaining its intensity and territorial range. Comparison with other, e.g. chemical, methods, and with distance from polluting source, showed good correlation. [Cf. *For. Abstr.* 16 (No. 3779).]

43. Forest Fires

See also No. 3744.

4061. **Southern Fire Conference Issue.** *Amer. For.* 62 (5), 1956.

A number devoted to the Southern Forest Fire Prevention Conference held at New Orleans in April 1956. A number of addresses (mostly concerned with the education of the public) are printed.

4062. **State of California forest fire report 1955.** Division of Forestry, Department of Natural Resources, Sacramento, Calif. [1956]. pp. 37.

Covers the exceptionally hazardous season of 27 Aug.–13 Sept. during which 305 fires occurred and 130,000 acres of forest were burnt.

431. Predisposing Factors and Causes. Fire Danger. Fire Behaviour

4063. SEIGUE, A. La notion de 'risque permanent d'incendie'. [**The concept of permanent fire danger.**] *Rev. for. franç.* 8 (5), 1956 (340–6). [F.]

The mean fraction (*R*) of the total area of a forest burnt annually is taken to represent the permanent fire danger of that forest. Application of this factor to data from the Cork Oak forests of N.E. Algeria covering 70–80 years, gives values of *R* ranging from 0·1 to 8%, which correspond strikingly with the empirical rating given by foresters working in the area. It is concluded that *R* is a good index of the permanent fire danger, and its application to some specific problems is illustrated, e.g. the degree of fire danger making it (*a*) undesirable to strip Cork Oak on account of the increased susceptibility of stripped trees to fire injury, (*b*) worth while cutting back a burned stand in the hope of obtaining coppice regrowth.

432. Prevention and Control

See also No. 4640.

4064. El problema de los incendios en Venezuela. [**The fire problem in Venezuela.**] *Agric. venez.* 20 (182; 183), 1955 (18–23, 26; 16–19, 52). [Span.] A.P.B.

A department for the prevention and control of fires was created in Venezuela in 1954 under the Department of Renewable Natural Resources, and is now drawing up a plan for future policy. The causes of fires, their effects, the present law and plans for the future are reviewed.

4065. WALLACE, O. P. **Some economics of fire control in New Hampshire.** *For. Mimeo N.H. agric. Exp. Sta.* No. 4, 1956. pp. 2.

Gives some tabulated data showing the relationship of control measures (time, size of crew, costs etc.) to size of fire.

4066. MILLER, H. R. **Chemical fire retardants for wild land fire control.** *For. Res. Note Calif. For. Range Exp. Sta.* No. 105, 1956. pp. 5. 1 ref.

Sodium calcium borate was successfully used in controlling fire in experiments in 1955, e.g. in direct attack on burning brush and grass, to hold the flanks, rear and head of fires, for counterfiring lines, and in controlling burning. Best results were obtained from a concentration of 5 lb./[U.S.] gal. water, through a spray nozzle of 4·5–7 gal./min. capacity, at a pressure of 150 lb./sq. in. Preliminary indications are that aerial application is feasible.

433. Salvage and Disposal of Fire-damaged Timber

4067. BASHAM, J. T. **The deterioration of fire-killed Pine stands.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (1), 1956 (2).

Gives tabulated data on progressive reduction in recoverable merchantable volume/acre of fire-killed stands of (1) *Pinus banksiana* and (2) *P. resinosa* over a period of 5 years from burning, caused by direct fire damage, sapwood rot, and heart rot.

435. Benefits of Fire Control. Injurious Effects of Fire. Fire Losses

See also Nos. 3718, 3744, 3803, 4062.

4068. **Forest fire losses in Canada 1954.** Forestry Branch, Department of Northern Affairs and National Resources, Ottawa. 1955. pp. 14 + 6 tbls.

436. Beneficial Effects of Fire. Uses of Fire in Silviculture and Other Forms of Husbandry

See also Nos. 3572, 3718, 3744, 3838.

4069. LOTTI, T. **Eliminating understorey hardwoods with summer prescribed fires in Coastal Plain Loblolly Pine stands.** *J. For.* 54 (3), 1956 (191–2). 1 ref.

Experiments extending over several years show that prescribed burning carried out in summer for 4 consecutive years will kill 90% of *Myrica cerifera*, 60% of *Liquidambar styraciflua*, 40% of *Nyssa sylvatica* and 20% of various Oaks. Winter burning is less effective and usually followed by resprouting. The importance of suitable weather and fuel conditions is stressed. [Cf. *For. Abstr.* 16 (No. 3110).]

44. Damage by Harmful Plants. Virus Diseases

441. Weeds

See also Nos. 3731, 4069.

4070. SAMPSON, A. W., and SCHULTZ, A. M. **Control of brush and undesirable trees.** *Unasylva* 10 (1), 1956 (19–29). 43 refs.

The first of a series of articles on equipment for control of brush etc. The present section discusses general conditions determining the type of equipment to be used, e.g. topography, land use, economic returns from the cleared land. References are all to American conditions and literature.

Weeds: Chemical Control

See also Nos. 3806, 3904, 3930, 3943, 3947–57, 4004–7, 4047–8.

4071. LEONARD, O. A. **Classification of woody plant responses to herbicides.** *Res. Progr. Rep. 14th West. Weed Control Conf.* 1954 (46–60). O.R.E.

Tabulated data on ca. 70 N. American species and their reaction to various chemical treatments.

4072. WOODS, F. W. **Control of woody weeds: some physiological aspects.** *Occ. Pap. Sth. For. Exp. Sta.* No. 143, 1955. pp. 50. 235 refs.

A review of the literature (chiefly American) on plant physiology as it affects the action of phytocides of the growth-regulator type, dealing in particular with the accumulation of carbohydrates in roots and its seasonal fluctuations, the C/N balance and the influences of light, temperature, soil conditions etc. on the one hand, and the effect of combined preparations, and of various adjuvants, on the other.

4073. **Chemical brush control.** *Sta. Pap. Alaska For. Res. Cent.* No. 2, 1955 (18–9). (*Rep. Alaska For. Res. Cent. 1954.*)

Dense brush in plots containing Western Hemlock and Sitka Spruce seedlings was successfully killed by an NH_4 sulphamate spray applied at the rate of 1 gal. spray/400 sq. ft. (ca. 108 gal. spray or 54 lb. chemical/acre). Mortality of Western Hemlock seedlings was high, but Sitka was killed only by direct heavy spray. Current leader growth had not been completed at time of treatment and the seedlings were probably especially susceptible. Costs of labour at 34 man-hours/acre and of the chemical totalled \$80·66/acre; these are too high to permit large-scale application. Treatment should be given during the first 5 years, before brush reaches the size of that treated in this experiment. Further tests will be made of the effect of spraying patches to allow seedlings to become well established.

4074. MEYERS, W. A., BEATTY, R. H., and ALLEN, W. W. **Progress report on amizol (3-amino-1,2,4-triazole) on woody plants.** *Proc. 10th Ntheast. Weed Control Conf.* 1956 (202–5). From *abstr.* in *Weed Abstr.* 5, 1956 (503). O.R.E.

Two years' tests on the use of foliage sprays of amino triazole on woody species are described. Rates of 3, 6, 9 and 12 lb./100 gal. water applied to run-off showed wide variation of susceptibility between different spp. *Rhus radicans* was the most sensitive and could be controlled by 2 lb./100 gal. if applied at the full-leaf stage. The 6 lb./100 gal. rate also controlled *Fraxinus americana*, *Prunus serotina*, *Carya tomentosa*, *Rhus toxicodendron*, and several species of *Quercus*. Species less sensitive but showing promise of control are *Tilia americana*, *Fagus americana*, *Magnolia acuminata*, *Ulmus americana*, *Rubus* spp., *Rhus typhina*, *Xanthoxylum americana*, *Symphoricarpos* spp. Species resistant to amino triazole are *Vaccinium* spp., *Sassafras variifolium*, *Rhus glabra*, *Acer rubrum*, *Comptonia peregrina*, *Viburnum* spp., *Lindera benzoin*, *Crataegus* spp., *Sambucus canadensis*, *Carpinus virginiana*, *Aesculus* spp. and *Populus tremuloides*.

4075. PLAYFAIR, L. **Control of woody plants.** *Res. Rep. West Sect. nat. Weed Comm. Can.* 1955 (79–80). From *abstr.* in *Weed Abstr.* 5, 1956 (561). O.R.E.

Rhus radicans was treated with DB spray powder and DB granular (borate + 2,4-D mixtures) at 1 and 3 lb./100 sq. ft., and with amino triazole at 2 and 4 lb./acre. Over a year later there was no regrowth in plots treated with amino triazole (which also gave complete defoliation) and with DB spray powder. Plots dusted with the DB granular form showed some regrowth. A mixture of 25 lb. $NaClO_3$ and 2 lb. 2,4-D applied in June as a foliage spray to a brush mixture of *Alnus*, *Salix* and *Rubus fruticosus* gave a complete kill of all species, with no regrowth up to the end of October. 2,4,5-TP was applied in mid-June at 2 and 3 lb./100 gal. water to a mixture of *Sambucus* sp., *Spiraea* sp., *Rubus fruticosus*, *Cirsium arvense* and *Sisymbrium officinale*. The plants generally reacted very slowly to the chemical. *R. fruticosus* and *Sambucus* sp. showed complete kill when finally reacting to the chemical. On *Spiraea* sp. top kill occurred but all plants showed regrowth from the base. This was in British Columbia. In Manitoba the chemical was applied at 2 lb./acre by an air-blast machine to a mixed growth of *Quercus macrocarpa*, *Populus alba*, *P. nigra*, *Salix* spp., *Prunus pennsylvanica* and *P. virginiana*. Only *Q. macrocarpa* was markedly affected and, with this exception, much better control was achieved on near-by plots sprayed with 2,4-D (ester) at 2 lb./acre. Following an application in June of 2 and 4 lb./acre of 2,3,6-trichlorobenzoic acid in 15 and 30 imperial gal. water respectively, to mixed woody growth, late autumn examinations showed dead or dying top growth on most species. Effects were most noticeable on *Quercus macrocarpa*, *Salix* spp. and *Corylus avellana*. Other species affected were *Populus alba*, *Fraxinus* sp., *Crataegus* sp. and *Rosa* sp.

4076. QUICK, C. R., and BURRILL, W. S. **Use of hormone-type herbicides on *Ribes* in California.** *Res. Progr. Rep. 14th West. Weed Control Conf.* 1954 (26–7). O.R.E.

Trials showed lower kills of *R. roezli* with foliage sprays of MCP than with 2,4-D. *R. roezli* is harder to kill in the northern parts of the range than in the southern. Recent tests with a mixed formulation of 2,4-D (⅔) and 2,4,5-T (⅓) containing special emulsifiers, and with 0·4% diesel oil added, gave 100% kill of the northern form in mid-season applications at rates of 250, 500, 750, and 1000 p.p.m. total acid equivalent (t.a.e.) and very promising results in late-season applications. Results of 1952 basal sprays on *R. roezli* showed that the t.a.e. weight of 2,4-D in the south, and of 50/50 or 67/33 mixtures of 2,4-D and 2,4,5-T in the north, can be reduced from 5 to 3% when the diluent is diesel oil or petroleum weed-killing oil, provided that treatment is thorough. To obtain a 100% kill of *R. nevadense*, higher concentrations of the acid are required. In practice, both species in association can be satisfactorily dealt with, provided that the concentration of 2,4-D or 2,4,5-T does not drop below 500 p.p.m. In basal stem treatments of *R. cereum*, esters of mixed 2,4-D and 2,4,5-T (50/50 and 67/33), when diluted with diesel oil to 4% t.a.e. weight, give satisfactory kills. A good kill of *R. montigenum* was obtained with foliage sprays of 2500 p.p.m. a.e. of 2,4,5-T esters that included 5% diesel oil, and excellent results were obtained from basal stem treatments with esters of 2,4,5-T diluted to 5% a.e. in diesel oil. [Cf. *For. Abstr.* 15 (Nos. 389–90).]

4077. MOSS, V. D. **Development in chemical methods of *Ribes* suppression in the White Pine forests of Washington, Idaho and Montana during 1953.** *Res. Progr. Rep. 14th West. Weed Control Conf.* 1954 (27–8). O.R.E.

Low-volatile esters, as a group, are more effective on *Ribes* spp. throughout the growing season than the volatile esters of 2,4,5-T; the butoxyethanol ester and the propylene glycol butyl ether ester produced the most satisfactory results and are the easiest to mix and store. The emulsifiable acid of 2,4,5-T was as effective as the best low-volatile ester, but has the disadvantage of being difficult to mix and store at temperatures $< 50^\circ$ F. The effectiveness of a specific dosage of 2,4,5-T increases with volume of spray, and the effectiveness of volatile esters of 2,4,5-T is increased by the addition of spreader-penetrant-sticker materials.

4078. RUTH, R. H., and BERNTSEN, C. M. **Chemical basal treatment to control Red Alder.** *Res. Note Pacif. Nthwest. For. Range Exp. Sta.* No. 128, 1956. pp. 6.

Stems of trees in a 6-year stand were sprayed with a 4 or 8% concentration of 2,4,5-T in diesel oil or 2,4,5-T plus 2,4-D to a height of 12 in. for trees < 3 in. diam. and to a height equal to 4 times the diameter for larger trees. Equipment is illustrated. After 15–17 months 96% of the treated trees were dead and the remaining 4% were largely defoliated. Costs for the 8% 2,4,5-T were $0·44/tree, and 90 trees were treated per man-hour.

4079. FISHER, C. E., MEADORS, C. H., and BEHRENS, R. **Some factors that influence the effectiveness of 2,4,5-trichlorophenoxyacetic acid in killing Mesquite.** *Weeds* 4 (2), 1956 (139–47). 14 refs. From *abstr.* in *Weed Abstr.* 5, 1956 (395). O.R.E.

The results of several years' experiments on *Prosopis juliflora* with 2,4,5-T are reported. Maximum translocation appeared to take place during 50–90 days after leaf emergence, when the total sugar content was building up rapidly in the roots. Lack of soil moisture, which caused irregular growth of foliage, reduced the effectiveness of 2,4,5-T, and better kills were obtained on sandy loam than on heavy clay soils. Plants with stems < 3 in. in diam. were more effectively killed by 2,4,5-T than larger trees. Carriers of oil or oil/water emulsions did not appear to influence the action of 2,4,5-T when applied at 4, 8 and 12 gal./acre. Droplet size, formulation, and weather factors did not appreciably affect the effectiveness of 2,4,5-T. It is concluded that a rate of 0·5 lb./acre acid equivalent of low volatile ester of 2,4,5-T in 1/3 oil/water emulsion is effective and economic for the control of *P. juliflora*.

4080. ROACH, M. E., and GLENDENING, G. E. **Response of Velvet Mesquite in Southern Arizona to airplane spraying with 2,4,5-T.** *Journal of Range Management, Portland* 9 (2), 1956 (70–3). 9 refs. From *abstr.* in *Weed Abstr.* 5, 1956 (399). O.R.E.

2,4,5-T (ester) at 0·75 lb./acre acid equivalent gave a higher % top kill and actual plant kill of *Prosopis juliflora* than did the amine formulation. The mean % kill was lower from the 5 gal./acre application than from the 10 and 20 gal. Some slight increase in effectiveness favours the use of diesel oil over a non-toxic oil in the carrier. The oil/water ratio did not influence plant kill; top kill was greater with 1/3 oil/water mixtures than 1/7. The site of the *P. juliflora* influenced these differences.

4081. DAWKINS, H. C. **The use of arboricides in forest tree-weeding in Uganda.** *Tech. Note For. Dep. Uganda* No. 3/56, 1956. pp. 2.

A 2/1 mixture of 2,4-D/2,4,5-T in heavy diesel oil is sprayed on the base of stems when the bark is dry. Resistant species are frilled. Apparatus and protection for operators are discussed, and names and addresses of suppliers [mainly in the U.K.] of chemicals, equipment etc. are given.

4082. IVENS, G. W., and COCHRANE, D. G. **Effects of 2,4,5-trichlorophenoxyacetic acid on evergreen thicket vegetation in Kenya.** *Trop. Agriculture, Trin.* 33 (2), 1956 (136–44).

Gives the ht., diam., and % frequency of the trees, shrubs and climbers in dry evergreen *Scolopia/Erythroxylon/Euclea* forest in Nyanza at 4000–5000 ft. with 30–40 in. annual rainfall, which is a habitat of *Glossina pallidipes*. The % kills of these species are tabulated. This admittedly pilot trial failed to prevent sprouting of *Euclea divinorum* and *Acacia pennata*, the most resistant species.

4083. DEICKE. Praktische Erfahrungen aus einer chemischen Unkrautbekämpfung. **[Practical experiences in chemical weed control.]** *Forst- u. Holzw.* 11 (9), 1956 (180–2). 4 refs. [G.]

In small-scale experiments the Na salt of TCA, sprayed or spread mixed with sand at 15 g./sq. m., gave lasting control of *Molinia caerulea*. Ugex Special (Na salt of TCA + 2,4-D), applied similarly to bracken, killed it in 6 weeks without previous cutting, and prevented regrowth for several years. Pine seedlings planted the following spring were not injured. *Senecio sylvaticus* and *Stachys sylvaticus* tended to replace *Molinia* and bracken respectively. A larger-scale trial was less successful owing to exceptionally bad weather.

4084. CONWAY, E. **Effects of gamma-(2:4 dichlorophenoxy)-butyric acid on sporelings of bracken.** *Nature, Lond.* 177 (4519), 1956 (1088–9). 5 refs.

Young bracken plants showed positive reactions when treated with γ-2,4-DB.

443. Fungi and Bacteria

See also Nos. 3659, 3694, 3813–5, 4508–9, 4651.

Fungi and Bacteria: Natural and Biological Control

See No. 4085.

Fungi and Bacteria: Chemical Control

See Nos. 3873–5, 4046–7, 4086.

443.2. Diseases of Seed and Seedlings; Damping Off etc.

See also Nos. 3838, 3855, 3871–6.

4085. WHITE, L. T. **Biological control of seedling diseases.** *For. Chron.* 32 (1), 1956 (49–52). 6 refs. (*Contr. Div. For. Biol. Dep. Agric. Can.* No. 252.)

A conference paper with literature references.

4086. VAARTAJA, O. **Principles and present status of chemical control of seedling diseases.** *For. Chron.* 32 (1), 1956 (45–8). 20 refs. (*Contr. Div. For. Biol. Dep. Agric. Can.* No. 251.)

A conference paper with literature references.

443.3. Diseases of Older Stages

Stem, Butt and Root Rots; Root Diseases

See also Nos. 4127, 4259, 4508, 4514.

4087. GARRETT, S. D. **Biology of root-infecting fungi.** Cambridge University Press, London, N.W.1. 1956. pp. 293. 31 pp. of refs. Price £1. 10*s*.

Deals mainly with root/fungus relationships in field, plantation and garden crops, but the chapters on parasitic growth habit (pathogenic and mycorrhizal fungi), root surface and rhizosphere microfloras in relation to root infection, saprophytic behaviour of root-infecting fungi, saprophytic survival in infected host tissues, and the principles of root-disease control, all contain data on tree-root/fungus relationships.

4088. HORD, H. H. V., and HILDEBRAND, M. J. ***Armillaria mellea* in relation to regeneration of Red Pine, White Pine, and White Spruce.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (1), 1956 (2).

In experimental plantations (2 + 2 stock) of *Pinus resinosa*, *P. strobus* and *Picea glauca* it was found that after two growing seasons, 34·5% of dead plants had been attacked by *A. mellea*, *P. resinosa* being the most susceptible species.

4089. NORDIN, V. J. **Heart rots in relation to the management of Spruce in Alberta.** *For. Chron.* 32 (1), 1956 (79–84 + 2 photos). 10 refs. (*Contr. Div. For. Biol. Dep. Agric. Can.* No. 265.)

Discusses factors influencing the progress of decay, the relative importance of root and trunk rots, estimation of decay in timber stands, and its control and prevention.

4090. MOOK, P. V., and ENO, H. G. **Relation of heart rots to mortality of Red Spruce in the Green Mountain National Forest.** *For. Res. Note Ntheast. For. Exp. Sta.* No. 59, 1956. pp. 2.

Study of a high-altitude area, where old-growth Red Spruce had been observed to be dying for some years past, showed that > 60% of trees had some decay but that only 6·3% by volume of all trees was decayed, a surprisingly low amount for an average age of 259 years. No positive evidence was obtained that the presence of decay adversely affected trees except by making them more liable to windthrow. Mortality is probably caused by overmaturity of trees growing at high altitude in severe environmental conditions on shallow well drained soils.

4091. FENTON, R. H., and BERRY, F. H. **Heart rot of Virginia Pine in Maryland.** *For. Res. Note Ntheast. For. Exp. Sta.* No. 56, 1956. pp. 4.

Discusses, on the basis of a study of 168 trees and 382 logs cut from them, the use of external indicators and tree size and age in assessing the presence of heart rot and the loss to be expected; the possibility of reducing infection by pruning; the concentration of infection in the butt log; and scaling practices (based on sporophores and visible rot at the ends of logs). An examination of several hundred pulpwood butts from a 40-year stand showed only one trace of heart rot. Most pulpwood is taken from stands no older than this or from the unaffected tops of older trees.

4092. NOBLES, M. K. **Studies in wood-inhabiting hymenomycetes. III. *Stereum pini* and species of *Peniophora* sect. *Coloratae* on conifers in Canada.** *Repr.* from *Canad. J. Bot.* 34 (1), 1956 (104–30 + 1 plate). 22 refs.

Descriptions of sporophores and cultures, with results of infertility tests and records of hosts and geographical distribution, are presented for *S. pini*, *P. septentrionalis*, *P. pithya* and *P. separans*, and for an undetermined species isolated from sap rot of *Pinus banksiana*. *From author's summary.*

4093. WEST-NIELSEN, G., and OKSBJERG, E. Om rodfordærverangreb II. Fortsatte undersøgelser over granens vækst og sundhed. **[Damage by *Fomes annosus* II. Further research on growth and health of Spruce [continued].]** *Hedeselsk. Tidsskr.* 76 (4), 1955 (72–81). 1 ref. [Dan.] C.G.B.

Examination of a plantation of Norway Spruce and Silver Fir, established in 1907 with different nurse crops, showed that (1) most of the Spruce on the western border had disappeared, probably because of attacks by *F. annosus*; (2) both species showed gaps in two plots in the middle of the area which had been limed; (3) the proportions of the two species were: 45% Fir, 55% Spruce in plots with *P. mugo* as nurse and cleaned during the first 10 years; 70% Fir (of larger dimensions than the Spruce) on plots with Gorse as nurse; and 90% Spruce (of rather larger dimensions than the few remaining Firs) on plots with blue lupins. These and other investigations described [see *For. Abstr.* 16 (No. 3132)] are summarized and discussed. Some of the main conclusions drawn are that marling favours growth both of the nurse and of the main crop, without increasing *F. annosus*, that *P. mugo* is generally the most satisfactory nurse crop, except on poor and medium heath soils where it will outstrip the Spruce, and that attack by *F. annosus* is favoured by early vigorous growth of the Spruce. Investigations on a number of sites showed that *F. annosus* attack was absent in Spruce growing on deep layers of blown sand although there was probably, in some places, root contact with diseased trees on the neighbouring areas. Investigations on several sites where a strip had been cut through a well established stand showed attack to be high on the S.-facing and low on the N.-facing edge of the strip; while where a strip was cut early in the life of the stand, trees at the edge of the strip were equal or superior to those in the rest of the stand.

4094. JORGENSEN, E. ***Fomes annosus* (Fr.) Cke. on Red Pine in Ontario.** *For. Chron.* 32 (1), 1956 (87–8 + 2 photos). 15 refs. (*Contr. Div. For. Biol. Dep. Agric. Can.* No. 238.)

A short review of literature, with a first record of the occurrence of the fungus on *Pinus resinosa* in Ontario.

4095. BUCKLAND, D. C., and WALLIS, G. W. **The control of yellow laminated root rot of Douglas Fir [caused by *Poria weirii*].** *For. Chron.* 32 (1), 1956 (14–9).

A conference paper outlining current methods of control, followed by a discussion.

4096. GILL, L. S., and ANDREWS, S. R. **Decay of Ponderosa Pine slash in the southwest.** *Res. Note Rocky Mt. For. Range Exp. Sta.* No. 19, 1956. pp. 2. 2 refs.

Polyporus anceps, *P. abietinus* and *Lenzites saepiaria* are the chief fungi attacking slash in Arizona and New Mexico. *P. anceps*, the most abundant and active, spreads from fruiting bodies on the larger slash and cull logs into living trees where it causes red rot. Slash decayed by *P. anceps* is highly inflammable and quickly consumed. Unlopped tops are rapidly decayed by *P. anceps*, and discourage formation of its fruiting bodies and subsequent spread to living trees; whereas scattered slash decays less rapidly and favours development of *P. anceps* fruiting bodies on the larger pieces. It also encourages *L. saeparia*, which causes a brown cubical rot that makes long-glowing embers in a fire. Piling and bunching discourage decay, and cannot, therefore, be recommended.

Wilts, Diebacks etc.

See also No. 4140.

4097. CURL, E. A. **Removal of spores from mycelial mats and transmission of *Endoconidiophora fagacearum* by air currents.** *Plant Dis. Reptr.* 39 (12), 1955 (977–82). 1 ref. A.P.B.

Laboratory and field tests indicate the possibility of transmission of Oak wilt fungus by wind-blown spores from naturally occurring mycelial mats to wounded healthy Oak trees.

4098. DORSEY, C. K., and LEACH, J. G. **The bionomics of certain insects associated with Oak wilt with particular reference to the Nitidulidae.** *J. econ. Ent.* 49 (2), 1956 (219–30). 29 refs. [West Virginia Agricultural Experiment Station, Morgantown.]

[Cf. *For. Abstr.* 16 (Nos. 4241–4246).] The species of 27 families of Coleoptera, the adults of which were found associated with Oak-wilt trees, are listed. Among these, nitidulids were the most numerous of all insects attracted to fresh wounds and Oak-wilt mycelial mats. These insects strongly preferred fungal to artificial baits. Of the 7 baits tested, the most effective attractants for them were (*a*) *Ophiostoma pluriannulata*, (*b*) *Endoconidiophora fagacearum* and (*c*) *Graphium rigidum*. Details of the life cycle of some of these nitidulids (covering 21–25 days) are detailed. In West Virginia at least 3 generations are produced annually. Eggs are laid under the bark in moist wounds that consistently become overgrown with fungi, most commonly with (*a*) and (*c*) but also with (*b*). Hatching out in 3 days, the larvae feed on fungi through 4 instars before falling to the ground to pupate in the duff, where they overwinter as pupae or adults. It is considered that the nitidulids and the fungi (*a*) and (*c*) form a symbiosis and that (*b*), the Oak wilt fungus, is a new member of this association, to which the beetle is making increasing resort, with the sequel of a corresponding increase in the disease. The role of these insects in spreading and in fertilizing the heterothallic Oak wilt fungus has been proved elsewhere [cf. next abstract].

4099. Jewell, F. F. **Insect transmission of Oak wilt**. *Phytopathology* 46 (5), 1956 (244–57). 40 refs. (*Scientific Paper, West Virginia Agricultural Experimental Station* No. 513.)

Artificially contaminated nitidulids caged on fresh wounds in May and early June resulted in successful transmissions of the disease. The species concerned were *Glischrochilus sanguinolentus*, *Colopterus semitectus*, and *Carpophilus lugubrio*. Scolytids, histerids, ants and *Drosophila* spp. did not transmit the disease. The heterothallic nature of the wilt fungus was used to demonstrate the presence of spores on nitidulids found on diseased trees. By placing such beetles on A- and B-type cultures, perithecia were produced only according as the beetles carried the appropriate spermatizing spores (B or A respectively). Perithecia were produced on both cultures by other beetles, indicating that both types of spore were carried. Spores were also shown in faecal pellets, and suspensions from such pellets from culture-fed beetles served as successful inocula for fresh wounds. The techniques, mycelial mats and insects are illustrated [cf. preceding abstract].

4100. Cole, H., Jr., and Fergus, C. L. **Factors associated with germination of Oak wilt fungus spores in wounds**. *Phytopathology* 46 (3), 1956 (159–63). 9 refs.

Gives the results of laboratory studies, the object of which was to determine optimum infection-court conditions for the ascospores and conidia of 2 isolates of *Endoconidiophora fagacearum*.

4101. Englerth, G. H., Boyce, J. S., Jr., and Roth, E. R. **Longevity of the Oak wilt fungus in Red Oak lumber**. *For. Sci.* 2 (1), 1956 (2–6). 4 refs.

Chalara quercina was still isolated in some barked boards stickered for 16, or bulk-piled for 18 weeks, to which should be added an assumed 6-week log-storage period. None was isolated from sapwood with $< 20\%$ m.c. Penetration to 1 in. in boards and in logs occurred within 2 weeks of sawing or after 6 weeks of storage respectively. Steaming for 30 min. and kiln drying both killed the fungus; spraying with the Na salt of PCP did not.

4102. Englerth, G. H., Boyce, J. S., Jr., and Roth, E. R. **Oak wilt fungus can be killed by steaming or kiln drying**. *Sth. Lumberm.* 192 (2400), 1956 (46).

Experiments on boards cut from diseased but still living Appalachian Oaks showed that the fungus could live, and continue to grow inward, for over 24 weeks. It was not found alive in timber with a m.c. $< 20\%$, and either steaming or kiln drying to below this point gave effective control. Treating with Na salt of PCP did not kill the fungus, but prevented its entering sound boards.

4103. Caroselli, N. E. **The effect of various soil amendments on Maple wilt incited by *Verticillium* sp.** *Abstr.* in *Phytopathology* 46 (4), 1956 (240).

Nugreen, Milorganite, $CaCN_2$, a 6–8–7 fertilizer, $(NH_4)_2SO_4$, and $NaNO_3$ were applied at $\frac{1}{8}$, $\frac{1}{4}$, and $\frac{1}{2}$ lb. for each inch of d.b.h., to the soil surface, 1–9 months before the inoculation of trees of $1\frac{3}{4}$–6 in. d.b.h. with a virulent isolate (V-10). Some control was got with all treatments except the last, which was actually associated with severer symptoms, a fact corroborated in a test on smaller trees.

4104. Pereda, F. C. Hadromicosis del álamo producida por *Verticillium albo-atrum* (R. y B.). [***Verticillium* wilt of Poplars produced by *V. albo-atrum*.**] *Idia* No. 96, 1955 (22–4). 9 refs. [Span.] C.G.B.

An attack on *Populus* 'A.M.' by *V. albo-atrum* was reported in 1953 from the south of Buenos Aires province. Experiments by the Facultad de Agronomia y Veterinaria de Buenos Aires confirmed that the fungus is capable of attacking *Populus* 'A.M.' both through the soil above injured roots, and by direct infection of the stem. [Cf. *For. Abstr.* 16 (Nos. 3142–3).]

Cankers, Stem Rusts etc.

See also Nos. 4076–7.

4105. Magnani, G. Disseccamento di piante adulte di *Cupressus macrocarpa*. [**Canker of adult *C. macrocarpa*.**] *Monti e Boschi* 7 (4), 1956 (184–5). 6 refs. [It.]

Notes on the occurrence of *Coryneum cardinale* canker on *C. macrocarpa* in shelterbelts on the Pontine marshes. Studies are being made on the susceptibility of other *Cupressus* spp.

4106. Zycha, H. Eine Krebserkrankung der Sitka-Fichte (*Picea sitchensis* [Bong.] Carr.). [**A canker disease of Sitka Spruce.**] *Forstwiss. Cbl.* 74 (9/10), 1955 (293–305). 19 refs. [G.g.]

Cankers of Sitka Spruce are reported authentically for the first time in Germany. A study of 16 stem cankers revealed that the causal agent is probably *Nectria cucurbitula*. A susceptibility to frost injury on the part of young shoots was also evident. Modes of infection are discussed. The disease does not yet seem to be of sufficient importance to warrant limiting afforestation with Sitka Spruce.

4107. Kossenakis, G. Rapport sur les mesures préventives à prendre en Grèce contre l'*Endothia parasitica*. [**Report on preventive measures against *E. parasitica* in Greece.**] [*Pap.*] *3e Sess. Comm. int. Chât., Rome 1955* No. *FAO/CH/15-G*, 1956. pp. 2. [F.] Limited distribution.

Neither *E. parasitica* nor ink disease has so far been observed in Greece, possibly because of an innate resistance of the local race of *Castanea sativa*. Strict regulations regarding previous disinfection of wood, wood products, and fruit are now in force, and imports of these have practically ceased.

4108. Bazzigher, G. Über tannin- und phenolspaltende Fermente von *Endothia parasitica*. [**Tannin- and phenol-splitting enzymes of *E. parasitica*.**] *Phytopath. Z.* 24 (3), 1955 (265–82). 16 refs. [G.g.] O.R.S.

A paper-chromatographical study of the enzymes of cultures of *E. parasitica* and of sound and infected twigs of *Castanea sativa.*

4109. ANDERSON, R. L. ***Hypoxylon* [*H. pruinatum*] canker of Aspen.** *For. Pest Leafl. U.S. Dep. Agric.* No. 6, 1955. pp. 3. 5 refs.

4110. NATHER, H. Zum Massenauftreten von 'Rindentod' an Pappeljungkulturen im Jahre 1953. **[The mass occurrence of bark dying in young Poplar plantations in 1953.]** *Allg. Forstztg.* 65 (1/2), 1954 (9–10). [G.]

Cytospora chrysosperma and *Dothichiza populea* did great damage to mostly bottomland plantations in the exceptionally hot and dry summer of 1953. *Populus deltoides* var. *missouriensis* frequently showed infection at the base of last year's terminal shoot, *P. 'carolina'* frequently at the base of the stem, where the wounds were more readily occluded. Large-leaved varieties, which frequently lost their leaves that summer, were generally more susceptible, Mistakes (drying out) in planting, dryness of site. injuries, and damage by fertilizers are discussed.

4111. BUTIN, H. Über den Einfluss des Wassergehaltes der Pappel auf ihre Resistenz gegenüber *Cytospora chrysosperma* (Pers.) Fr. **[Effect of the water content of Poplar on its resistance to *C. chrysosperma*.]** *Phytopath. Z.* 24 (3), 1955 (245–64). 18 refs. [G.g.] O.R.S.

Artificial inoculations were made in wounds in Poplar twigs cut to lengths of 10 cm. and allowed to dry out to different moisture contents after the ends had been sealed with wax. Results include the following: (1) The critical level of water loss for infection was 18–22%, calculated on the total water content; there is, however, reason to suppose that a greater water loss would be needed for infection of living plants. (2) Microscopic investigation showed that high water loss prevented wound healing, thus encouraging infection. (3) A water content of 50%, calculated on the dry weight, provided optimum conditions for mycelial growth. In further experiments, leaf scars, inoculated after artificial removal of the leaf and before tyloses had formed, were infected successfully, the number of infections increasing with decreasing twig moisture content. Leaf scars that had healed normally could not be infected by this method. [Cf. *For. Abstr.* 15 (No. 1536).]

4112. ENDE, G. VAN DEN. Verslag van het onderzoek naar de populierenkanker in 1952 en 1953, veroorzaakt door *Pseudomonas syringae* v. Hall. f. sp. *populea* Sabet. **[Report on investigations in 1952 and 1953 on canker of Poplars caused by *P. syringae* f. sp. *populea*.]** *Mededelingen van de Nederlandsche Heidemaatschappij, Arnhem* No. 21, 1955. pp. 19. [Du.du.e.]

Trees inoculated in 1952–53 were examined in Sept. 1953 and Oct. 1954. There were differences in reaction in the two years, species normally resistant (e.g. × *P. serotina* and, to a lesser degree, × *P. gelrica* and × *P. serotina erecta*) reacting to the 1953 inoculation. No correlation could be found between temperature and rainfall immediately before and after inoculation but the mean temperature for Dec. 1953 was abnormally high (5·4° C.) and the continued growth of the bacterium until the frosts of Jan. 1954 may account for the greater effect on the trees. Results of inoculations on species and hybrids are tabulated. Only freshly collected slime proved virulent. Results from inoculations with slime from different species of Poplar were not uniform. Canker formation also varied, some seedlings forming cankers in the year of inoculation, others after 2–3 years. [Cf. *For. Abstr.* 14 (Nos. 3492–3).]

4113. HENRY, B. W. **Basal branches no symptom of fusiform rust on Slash Pine seedlings.** *Tree Plant. Notes* No. 24, 1956 (16).

Two fairly large-scale tests have shown that *Pinus elliottii* seedlings with basal branches are not necessarily infected with *Cronartium fusiforme*. American nurserymen have been in the habit of culling seedlings with basal branches, in the belief that these were a symptom of the rust.

4114. LIGHTLE, P. C. **Longevity of *Peridermium harknessii* aeciospores stored at 40° F.** *Plant Dis. Reptr.* 39 (12), 1955 (983–4). 4 refs. A.P.B.

Under favourable storage conditions, aeciospores of *P. harknessii* are capable of living over an entire year, though it is questionable whether they do so in nature.

4115. HADDOW, W. R. **Blister rust control as an element of White Pine management.** *For. Chron.* 32 (1), 1956 (68–73). 1 ref.

A general discussion illustrated by figures for incidence of blister rust in Ontario.

Foliage Diseases

See also No. 3835.

4116. NORDIN, V. J. **An epidemic occurrence of needle rust of White Spruce in Alberta.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (1), 1956 (3).

The disease was caused primarily by *Chrysomyxa ledicola*, with *C. ledi* secondary to it.

4117. STARK, R. W., and BOURCHIER, R. J. **Needle-miner and needle cast in Lodgepole Pine.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (2), 1956 (3–4).

In the course of surveys of defoliation caused by *Recurvaria* sp., it was found that severe defoliation was also occurring through a fungus, *Hypodermella montivaga*. In visual reconnaissance from aircraft, the two types of defoliation are more or less indistinguishable. The disease was much less common in mixed Pine/Spruce than in pure Pine stands. Possible effects of the disease on needle-miner populations are discussed.

4118. STOWELL, E. A. **A study of *Entomosporium* on *Crataegus*.** *Abstr. of thesis* in *Dissert. Abstr.* 16 (2), 1956 (222). [University of Wisconsin.] O.R.S.

A description of a leaf-spot fungus found on naturally-infected leaves of *C. oxyacantha* and an unidentified South Wisconsin species, its life history and parasite/host relations. It is suggested that *E.*

thuemenii is the correct name for the imperfect stage, the perfect stage constituting a new species, named *Fabraea thuemenii*.

45. Damage by Animals

451. Mammals

See also Nos. 3612, 3620, 3803–4, 3896–7.

4119. CASSADY, J. T., HOPKINS, W., and WHITAKER, L. B. **Cattle grazing damage to Pine seedlings.** *Occ. Pap. Sth. For. Exp. Sta.* No. 141, 1955. pp. 14. 2 refs.

On 5 grazed plantations in Central Louisiana, there was, in most cases, little or no increase of mortality but some loss of height growth, and recovery was good. Longleaf Pine, however, in a detailed grazing study, showed considerable damage, particularly from trampling in the grass stage. In one direct-sown area, cattle helped to reduce weeds in the first season, but later caused considerable losses. Damage was even worse where seedbed disking had produced succulent new grass. Restriction or exclusion of cattle during the early years, particularly in winter, is desirable.

4120. KEBBEL, R. Schutz junger Pappeln gegen Weidevieh. [**Protection of young Poplars against cattle.**] *Holz-Zbl.* 82 (38/39), 1956 (511). [G.]

Describes a tree guard made of 6 impregnated laths joined into a rigid circle by galvanized-iron bands. It is not fixed to the ground but fastened by a double line of plastic string attached to two opposite stakes and running through two rings, one on each side of the tree. This keeps the tree in a central position without fear of bark injury as the tree grows. As the guard thus moves with the tree in a wind, there is also no danger of bark injury from rubbing or knocking against it. Each guard costs ca. DM.4 and should last some 20 years.

4121. KESSL, J., and FANTA, B. Příčiny okusu a ohryzu lesních dřevin zvěří. [**Causes of browsing damage by wild animals.**] *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 28 (1), 1955 (85–94). 18 refs. [Cz.cz.russ.]

The food available in forest to herbivorous animals can be classified as: (*a*) summer green food (sappy grasses and herbs, foliage of trees and shrubs); (*b*) fruit of herbs, shrubs and trees; (*c*) buds and shoots of trees; (*d*) needles of conifers; (*e*) living bark and bast of trees and shrubs; (*f*) waste (e.g. dead stems and foliage); (*g*) roots, rootstocks, bulbs etc.; (*h*) green shoots of hibernating herbs, grasses etc.; (*j*) other fodder (mosses, lichens, fungi etc.). In May and June (*a*) is almost the only fodder. In July and Aug., (*a*) is less eaten, and browsing of (*c*)–(*e*) begins. In Sept. and Oct., (*a*) is still the important fodder, but consumption of (*c*)–(*e*) increases rapidly. In Nov.–Jan. (*a*) disappears, and (*b*)–(*j*) are the fodder sources, Finally, in Feb.–Apr., (*c*)–(*e*) are usually the available food sources. Tables show: (1) % of trees browsed in every month for each of up to 10 species observed (for hares, roedeer, and red deer separately) in different experimental plots in Czechoslovakia, (2) weights of the browsed portions of plants of 13 species (height 20–200 cm.), and (3) numbers of plants of 6 species (height 20–200 cm.) browsed during 120 days by roe and red deer.

4122. SPENCER, D. A. **The effects of rodents on reforestation.** *Proc. Soc. Amer. For. 1955*, 1956 (125–8). 9 refs.

A short review of the subject.

4123. SCHINDLER, U. **Rodent control with toxaphene and endrin in forests in West Germany.** *FAO Plant Prot. Bull.* 4 (5), 1956 (67–8). 12 refs. [Niedersächsische Forstliche Versuchsanstalt, Abt. B, Göttingen.]

An English version of a previous article [see *For. Abstr.* 17 (No. 2991)].

4124. HILDRETH, A. C., and BROWN, G. B. **Repellents to protect trees and shrubs from damage by rabbits.** *Tech. Bull. U.S. Dep. Agric.* No. 1134, 1955. pp. 31. 91 refs.

The Cheyenne Horticultural Field Station in Wyoming has for 22 years been screening many materials and mixtures for repellency to rabbits (*Lepus* and *Sylvilagus* spp.). Most of the materials proved to be unsatisfactory for protecting trees, because of their toxicity to plants, insufficient repellency, or both. Four materials met most of the requirements of a satisfactory repellent: nicotine, nicotine sulphate, and the di- and monosulphides of tetramethylthiuram, the first 3 of which are available in commercial insecticides or fungicides. Water emulsions of asphalt or of certain synthetic plastics proved to be suitable vehicles for any of these repellents. Formulas for making repellent mixtures are given. *From authors' summary.*

4125. **Damage by elephants.** *Rep. For. Dep. N. Rhod. 1955*, 1956 (4).

Elephants have a special partiality for the bark of *Pterocarpus angolensis*. In the Mvuvye area, extensive counts showed that 30% of mature trees had been ring-barked for more than half their circumference; and > 60% of *P. angolensis* trees in 300 sq. miles of country had been damaged by elephants to some extent.

4126. LAUCKHART, J. B. **The effect of logging old-growth timber on bear.** *Proc. Soc. Amer. For. 1955*, 1956 (128–30). 5 refs.

Discusses the increase in bear damage to young regeneration, resulting from logging in the Douglas Fir region.

4127. HEGER, A., KURTH, H., and FASSL, B. Ein Beitrag zur waldbaulichen Behandlung geschälter Fichtenhölzer. [**The silvicultural treatment of deer-damaged Spruce stands.**] *Arch. Forstw.* 4 (2/3; 4), 1955 (184–225; 309–62). 24 refs. [G.] [Fakultät für Forstwirtschaft, Tharandt.]

Haufe (1937) reported that red-deer damage affected 70,000 ha. in the Erzgebirge and the Elbe sandstone mountains, the annual loss being then assessed at RM.175,000. Working-plan data indicate that the position had improved somewhat by 1953. Krutzsch's recommendation to put all stands with > 80 and those with 61–80% of damaged stems in the immediate and next felling categories respectively, is rejected as altogether too drastic, as it would lead to the placing of very large areas under felling and regeneration, exposing the remainder to serious wind damage, and dislocating the yield. The object of the present investigation is to establish principles for the silvicultural treatment of such stands. Each tree in a 48-year stand showing 70% of stems damaged was recorded for diameter, height, tree class, and bark damage (4 classes). An improvement felling removing respectively 38, 26 and 22% of the stems, basal area and volume, afforded data on size and associated decay, diameter and height increment, and the proportions and money value of yields of 3 grades of pulpwood and one of fuel. Stem analyses were made from the wound class most represented in each tree class and compared with increment borings taken on standing healthy trees. The data, presented in photographs, analysis diagrams and graphs, show that the loss of increment due to bark-scaling increases as the order of tree class decreases, the suppressed trees showing the greatest loss. Silvicultural prescriptions based on value increment are discussed and detailed. A similar investigation was made in four older stands, the ages and % of scaled stems of which were 92/29·3, 70/58, 91/69·1 and 59/94·9 respectively. Their loss in value increment averaged about 12%. General recommendations for the treatment of such damaged stands in the Erzgebirge include conversion to mixed uneven-aged stands, using, where available, damaged young growth or weak pole stands as nurse crops, and underplanting with Beech, Silver Fir and Sycamore Maple or, in larger openings, Larch.

4128. Neils, G., Adams, L., and Blair, R. M. **Management of white-tailed deer and Ponderosa Pine.** *J. For.* 54 (4), 1956 (238–42). 26 refs.

Describes a winter range at the Fisher River, Montana, of *Odocoileus virginianus macrourus*, whose excessive numbers totally prevent the regeneration of *P. ponderosa* and Douglas Fir. The economic loss, the cost and effectiveness of fencing and the alternative of reducing the deer population are discussed.

4129. Weber, H. R. Einzäunungen im Walde. [**Fences in the forest.**] *Schweiz. Z. Forstw.* 107 (4), 1956 (288). [G.]

Deer that are being chased out of a fenced area often damage themselves considerably as they dash about in alarm and fail to find the exit made for them. Gates that cut off the corners of the enclosure allow the deer to be chased out along each fence without difficulty.

4130. Říbal, M., and Škorpil, V. Les—zásobárnou surovinových zdrojů na ochranu lesních kultur proti škodám působených [způsobeným] zvěří. [**The forest as a source of raw material for protecting plantations against damage done by forest animals.**] *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 28 (3), 1955 (461–78). 4 refs. [Cz.cz.russ.g.]

Illustrated description of different types of fixed and transportable fences and guards, made from Spruce poles and branchwood, to protect plantations from various classes of mammals.

4131. Lamprey, H. F. **Control of [African] game and vermin animals.** *World Crops* 8 (2), 1956 (81–3). O.R.E.

Practical instructions on electric fences.

4132. **Electric fencing against game: experiments in Tanganyika.** *Oryx* 3 (3), 1955 (138–43). 1 ref.

Quotes experiments from the *Report, Tanganyika Game Department 1954*, in which 100 acres of mixed food-crops were immediately protected from bush-pig (the worst offender) by a single strand of 12-gauge wire 15 in. from the ground. Bushbuck jumping the fence learnt in 3 weeks by occasionally touching the wire to avoid the area. Baboons learnt similarly in 3 weeks after additional strands had been stretched at 25 and 40 in. for 100 yards astride their customary ingress paths, but the vervet monkey continued to enter either underneath or by jumping through the trebled wire. Damage to crops was greatly reduced immediately outside the area, and the crops saved within it paid twice over for the cost of the fence. A strand at 40 in., stretched across a corridor 1½ mile wide, guarded by natural obstacles at both ends, ceased to be broken by small herds of elephant and walking rhino after 4 weeks. Two small herds of zebra learnt immediately and turned back from the fence. A herd of 60 wildebeest whose grazing ground was divided, charged through the posts before they were wired and repeated this daily for 10 days through the wire. By the third week the fence was avoided, the zebra struggling through the mud of the lake at one end of it. The spoor of a herd of 50 buffalo was too confused to read, but both this animal and the giraffe are probably educable. These fences certainly warrant further test, particularly for the protection of crops and plantations from the more static populations of marauding game which stay long enough to learn.

452. Birds

See also Nos. 3615, 3877, 3898.

4133. **Depredations of the Kaka [*Nestor meridionalis*].** *Mon. News Lett. N.Z. For. Serv.* 6 (1), 1956 (7). Limited distribution.

This bird has been found to have a habit of tearing green Kauri cones to pieces and cutting green twigs and branches from trees during spring and early summer. It also strips bark from Beech [*Nothofagus*] saplings.

453. Insects

See also Nos. 3813, 3816, 4651.

4134. **Forest insect research.** *Rep. Ntheast. For. Exp. Sta. 1955*, 1956 (4–37, 67–118).

An account of the problem in the region as a whole, progress in biological, chemical and silvicultural control, specific problems, and the research programme, with descriptions of individual pests of forests and forest products currently causing concern.

4135. Ewan, H. G. **A method for measuring the insect population on trees 6 to 12 feet tall.** *Tech. Note. Lake St. For. Exp. Sta.* No. 455, 1956. pp. 1.

A cone-shaped tent of polyethylene plastic, 12 ft. high and with a basal diameter of 10 ft., is dropped over the tree, and a quickly-effective insecticide (e.g. 0·5–1·0% pyrethrum in oil) is applied from a hand spray inside the tent by a man who afterwards shakes the branches so that the insects fall on to a muslin ground-sheet. The circular base of the tent is kept rigid by ½-in. piping bent into a circle, in 3 sections for easy transport. A small loop of plastic is attached to the top of the tent and fastened to the end of a long aluminium pole, by which the tent can be picked up and guided into position.

4136. Elmer, J. L., and Smith, R. G. **Some pests of Black Wattle in Kenya with a list of other insects inhabiting the plantations.** *E. Afr. agric. J.* 21 (4), 1956 (230–47). 9 refs.

Discusses in detail damage caused by *Nematocerus perditor* and control measures, and, rather more briefly, other Coleoptera, Hemiptera, and Lepidoptera. Gives an annotated list of nearly 70 species so far found in Kenya Wattle plantations.

Insects: Natural and Biological Control

See also Nos. 3611, 3614, 4153–6, 4171–2, 4176–7, 4182–7, 4194, 4232, 4236–7, 4240–1, 4245–6, 4249–50.

4137. Klomp, H. **On the theories on host-parasite interaction [in insects].** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/24/10, 1956. pp. 8. 17 refs.

Reviews the principal theories, with particular reference to those of Thompson and Nicholson.

4138. Prebble, M. L. **Virus and other diseases of forest insects in Canada.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/24/15, 1956. pp. 6. 48 refs.

A short review of research initiated, particularly since 1946 at the Forest Insect Laboratory, Ontario, and its application to control of forest insect pests.

4139. Issel, B., and Issel, W. Versuche zur Ansiedlung von 'Waldfledermäusen' in Fledermauskästen. [**Establishing colonies of 'forest' bats by means of shelter boxes.**] *Forstwiss. Cbl.* 74 (7/8), 1955 (193–204). [G.]

The establishment of colonies of bats in forest stands is considered highly desirable because of their value as predators of harmful insects. A study was made of several species in their natural conditions and the effects were recorded of the introduction of specially designed boxes into forest stands where suitable natural quarters were scarce. Results after the first year showed promise. [Cf. *For. Abstr.* 16 (No. 676).]

Insects: Chemical Control (General)

See also Nos. 3880, 3900, 4046–7, 4165–7, 4173, 4188–90, 4198–9, 4206, 4220–1, 4247.

4140. Whitten, R. R. **Elm disease sprays: formulas and ingredients.** *Sta. Note Cent. St. For. Exp. Sta.* No. 92, 1956. pp. 2.

Gives the % by weight of DDT, xylol, emulsifier, acetone and white oil in 2 formulae, one for application by hydraulic sprayer and the other by mist blower; both have been found effective in controlling vectors of Dutch Elm disease and Elm phloem necrosis. The properties of the 5 ingredients are discussed.

4141. Clower, D. F. **A study of the factors that affect the phytotoxicity of mist concentrate formulations to American Elm (*Ulmus americana* L.) and some other woody ornamental plants.** *Abstr. of thesis* in *Dissert. Abstr.* 16 (3), 1956 (432–3). [Cornell University.] O.R.S.

Experiments with overdoses, corroborating and supplementing the findings of a previous paper [see *For. Abstr.* 13 (No. 4018)].

4142. Bray, D. F. **Phytotoxicity tests with Chlorothion.** *Sci. Tree Topics* 2 (3), 1956 (18–9).

Chlorothion, a P systemic insecticide, was sprayed at several concentrations on to 55 species of ornamental trees and shrubs. Lists are given of (*a*) species injured by applications at 3 lb./100 gal., and (*b*) species uninjured at concentrations of ½, 1, or 3 lb./100 gal.

4143. Haber, A. Wpływ arsenianów wapnia na ssaki i ptaki leśne. [**Effect of Ca arsenates on forest mammals and birds.**] *Roczn. Nauk leśn.* No. 8, 1955 (215–71). 32 refs. [Pol.pol.russ.e.] (*Prace Inst. bad. Leśn.* No. 132.)

Presents results of 1948–50 studies in the Łobodno forest district (Łódź province), where Pine stands were dusted with high % (12–20% and 40% As_2O_5) insecticide to control the outbreak of *Acantholyda nemoralis*. Figures are tabulated indicating the effect of the poison on: (1) small forest mammals; (2) deer, hares and rabbits; (3) cattle; (4) forest birds. The methods of sampling (including trapping) and the various causes of mortality are described and discussed for each category. Among birds, the flycatchers and robins suffered > 50% mortality.

4144. Záruba, C., and Lhotský, J. Vztah desinfekce půdy 'Hexachloranem' k základním půdním vlastnostem. [**Relationship between soil disinfection with BHC and the main properties of the soil.**] *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 28 (4), 1955 (493–520). 47 refs. [Cz.cz.russ.g.]

Results of preliminary investigations in Czechoslovakian nurseries show that the physical characteristics of the soil have no influence on the insecticidal efficiency of BHC; nor does soil pH within the limits usually encountered in forest nurseries, though this should be checked for extreme soil types, e.g. peaty or schist soils. No phytotoxic effect of BHC was observed.

4145. Cramer, H. H. Die Auswirkungen grossflächiger Schädlingsbekämpfung auf Waldbiozönosen. 2. Beitrag: Studien anlässlich einer Maikäferbekämpfung mittels Hubschrauber. [**The effect of large-scale pest control on forest biocoenoses. 2. Studies on cockchafer control by helicopter.**] *Z. PflKrankh.* 63 (3), 1956 (129–38). [G.g.e.] E.M.B.

The soil fauna was studied in a 40- to 60-year Beech forest (*a*) untreated, or (*b*) sprayed from a helicopter against cockchafers with 25 litres Forstviton (12% γ [BHC]) per ha. The treatment caused an immediate decrease in populations of soil fauna, but within 19 days numbers were normal again. There was no evidence of indirect damage to predatory beetles from the poisoned cockchafers. In (*a*), variation in soil-fauna populations was related to rainfall.

4146. Isler, D. A., and Yuill, J. S. **Research on the control of forest insects by aircraft.** *J. econ. Ent.* 49 (1), 1956 (92–4). 6 refs.

A summary covering history, dual spray (coloured dyes) test apparatus, atomization, nozzle arrangement, new aircraft, evaluation techniques, aerial surveys (visual and photographic). [Cf. *For. Abstr.* 16 (pp. 453–65); 17 (pp. 3–9; 149–59).]

Orthoptera

See No. 3878.

Hemiptera

4147. Bray, D. F. **Control of the Boxelder bug [*Leptocoris trivittatus*].** *Sci. Tree Topics* 2 (3), 1956 (9–11).

This insect congregates inside houses in large numbers in order to hibernate, thousands entering a single house. Spraying with a mixture of Dreft and Malathion gave 100% kill in 12 hours in laboratory conditions.

4148. Eaton, C. B. **The Saratoga spittlebug [*Aphrophora saratogensis*].** *For. Pest Leafl. U.S. For. Serv.* No. 3, 1955. pp. 4. 4 refs.

4149. **Saratoga spittlebug research improves survey techniques.** *Rep. Lake St. For. Exp. Sta. 1955* [1956] (32–3).

A formula, $X = a + b\frac{A}{B}$, is presented for calculating tree damage from nymphal population and host size and density, where X = tree damage (feeding punctures per 10 cm. of 2-year twig), A = nymphal population per $\frac{1}{10}$-milliacre and B = a tree size and density factor (average height × average whorls × number of stems per acre), and a and b are constants. The levels of X have been empirically classified as follows: 0–10 feeding punctures per 10 cm., light infestation; 11–29 moderate; 30 and more, heavy. This will allow the prediction of tree damage from spring nymphal populations and tree size and density, but other factors, e.g. extreme weather conditions or a high degree of parasitization, may nullify the relationship.

4150. Heymans, V. M. J. La lutte contre le *Phytolima lata* sur *Chlorophora excelsa* Benth. et Hook. **[Control of *Phytolyma lata* on Iroko.]** *Bull. agric. Congo belge* 47 (2), 1956 (321–32). [F.flem.]

For the protection of nursery stock, spraying every 15–18 days with a 0·05% solution of Folidol [parathion] at 200 c.c./sq. m. of bed has proved entirely adequate. For 18 months of such treatment, the cost per 100 plants is raised by Fr.19·80 but the enhanced growth in the nursery and in the field is likely to save 6–12 months' growing time with corresponding reductions in spraying costs. For field plants, because of the difficulty of effectively spraying leafless stump plants and because the new buds are immediately attacked, the following new technique is recommended: with an 8-mm. drill, a hole 15–20 mm. deep is bored in the top of each stump of 15–20 mm. diam.; into this hole a gelatine capsule containing 0·50 c.c. pure Folidol is inserted and covered with a leaf hood. The capsules are filled by hypodermic syringe under European supervision. Performance is 80 holes, 300 capsules and hoods, or 1000 fillings per man-day. This treatment gave almost complete protection for 7 weeks and was accompanied by good growth. Subtracting the cost of 4 sprayings thereby saved, it adds Fr.35·05 to the cost of one ha. of enrichment (100 plants). The subsequent treatment recommended is to spray, with 0·1% Folidol, every 21 days until a crown robust enough to resist attack has been formed (18 months) but further spraying up to 24 months at 5-week intervals may be necessary.

4151. Teucher, G. Über die Anfälligkeit von Douglasien- und Strobenherkünften gegenüber der Douglasienwollaus (*Gilletteella cooleyi* (Gill.) C.B.) bzw. der Strobenwollaus (*Pineus strobi* Htg.) in Deutschland. **[The susceptibility of different provenances of Douglas Fir to *Adelges cooleyi* and of *Pinus strobus* to *Pineus strobi* in Germany.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/24/18, 1956. pp. 4. [G.] [Institut für Forstwissenschaften, Eberswalde.]

4152. Postner, M. Zum Auftreten der Douglasienwollaus *Gilletteella cooleyi* Gill. (Chermesidae, Homoptera) an Sämlingen. **[The occurrence of *G. cooleyi* on seedlings].** *Forstwiss. Cbl.* 74 (7/8), 1955 (235–8). 12 refs. [G.]

Reports the occurrence in southern Germany of this pest on 1- to 3-year-old Douglas Fir seedlings, and gives notes, with references to literature, on *G. cooleyi* in Germany.

4153. Schremmer, F. Über ein Vorkommen der Tannenstammlaus *Dreyfusia* (*Adelges*) *piceae* Ratz. im Wienerwald und ihren Vertilgerkreis. **[An outbreak of *A. piceae* in the Viennese forests, and its natural enemies.]** *PflSchBer.* 16 (4/6), 1956 (49–69). 21 refs. [G.g.e.] C.G.B.

Presents the results of observations on the biology of the pest, the cause of the attack, and 18 different predators, with preliminary notes on a parasitic fungus, as yet unidentified, found on preserved material.

4154. Brauns, A. Beiträge zur Ökologie und wirtschaftlichen Bedeutung der aphidivoren Syrphidenarten. **[On the ecology and economic significance of aphid-eating syrphids.]** *Beiträge zur Entomologie, Berlin* 3 (3), 1953 (278–303). 39 refs. [G.] I.I.E.

Describes chiefly their morphology, feeding habits, and peculiarities of their life cycle (diapause), and discusses the suitability of *Lasiopticus pyrastri* or *Syrphus vitripennis* for biological control of aphids.

4155. Schmutterer, H. Ergebnisse von Zehrwespenzuchten aus Schildläusen (I. Teil). **[Breeding Chalcididae from Coccidae. (Part 1).]** *Beiträge zur*

Entomologie, Berlin 3 (1/2), 1953 (55–69). 27 refs. [G.] I.I.E.

Lists over 30 chalcids, generally with the place and host where found, and breeding results. The hosts include numerous forest pests, all from S. Germany. [Cf. *For. Abstr.* 13 (No. 3154).]

4156. HOVEY, C. Y. **Notes on natural control of the Pine needle scale *Phenacaspis pinifoliae* Fitch.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (1), 1956 (3).

The most important factor in the control of this scale insect on *Picea glauca* in Saskatchewan was found to be a small coccinellid, *Microweisia marginata*. Notes are given on the life history and habits of the predator.

4157. BRAY, D. F. **Grape scale infesting Hemlock.** *Sci. Tree Topics* 2 (3), 1956 (21).

The grape scale, *Aspidiotus uvae*, was found infesting a *Tsuga* hedge in Rhode Island in such numbers that part of the hedge had been killed. Only the twigs and branches were infested, the leaves being completely free. Spraying with 4 lb. 25% Malathion wettable powder per 100 gal. gave good control.

4158. DUDA, E. J. **The Holly pit-making scale [*Asterolecanium puteanum*.]** *Sci. Tree Topics* 2 (3), 1956 (6–9). 2 refs.

This insect is a serious pest of ornamental *Ilex* spp. in the southern U.S. A single application of Toxaphene 40% emulsifiable in an aqueous spray at 1 quart/100 gal. gives complete control.

4159. SĂVESCU, A. O specie nouă de păduchi ţestoşi, păduchele virgulă al plopului (*Lepidosaphes populi* Săvescu n. sp.) (Coccoidea-Diaspididae.) **[A new scale insect, the Poplar twig scale (*L. populi* sp. nov.).]** *Bul. şti. Acad. Repub. rom.* (*Sect. Biol.*) 7 (4), 1955 (915–25). 6 refs. [Rum.russ.f.] O.R.S.

Describes a new scale insect, first recorded in 1944 near Ploeşti, and since then in 6 other localities in Rumania. It attacks Poplars, Robinia, Willow, and Ash and is particularly dangerous to the first two. It is parthenogenetic, and differs from *L. ulmi* in having only one generation annually.

Lepidoptera

See also Nos. 4117, 4523.

4160. PACLT, J. Systematisches Verzeichnis der in Mitteleuropa als Forstschädlinge auftretenden Schmetterlinge. **[A systematic list of Central European Lepidoptera injurious to forests.]** *Beiträge zur Entomologie, Berlin* 3 (1/2), 1953 (1–29). [G.] I.I.E.

A list, giving for each species the date of first description, and a reference either to a German standard work or to the article introducing the species. The nomenclature is stated to be revised according to modern principles, and a list of synonyms is appended.

4161. GÄBLER, H. Beitrag zur Kenntnis von tierischen Forstsamenschädlingen. **[On insect pests of forest seeds.]** *Beiträge zur Entomologie, Berlin* 3 (5), 1953 (479–87). 3 refs. [G.] I.I.E.

Deals chiefly with the appearance of insect damage on the flowers of Willow, Poplar and Birch. Among the species identified are *Egle parva*, *Epiblema nisella*, *Orthosia circellaris* and *Xanthia gilvago*. Spraying with P esters is stated to control the last named without damaging the flowers.

4162. MARTIN, J. L. **Tortricids on *Pinus sylvestris*.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (1), 1956 (1–2).

Considerable damage is done to young plantations of *P. sylvestris* in Ontario by tortricids which attack young trees, usually ca. 2 ft. high, in spring and early summer, web the leading shoots together, and feed on the needles, bark and wood. The resulting malformation can be corrected by pruning, but 2–3 years' additional growth are necessary before the trees can be marketed. The insects are particularly troublesome in young plantations on old fields with heavy weed cover, but they cause little damage after the trees have overtopped the weeds. At least 5 species are involved: *Tortrix pallorana*, *T. alleniana*, *Archips rosaceana*, *Sparganothis unifasciana* and *S. sulphureana*. All are weed-feeders for most of the year, overwinter as larvae on the weeds and attack the young Pine shoots early in the spring.

4163. BEAN, J. L., and BATZER, H. O. **A Spruce budworm risk-rating for the Spruce-Fir types in the Lake States.** *Tech. Note Lake St. For. Exp. Sta.* No. 453, 1956. pp. 2.

Gives connected tables for use in assessing risk to mixed stands of Black and White Spruce, and Balsam Fir. The risk factors used are: age, density (expressed as volume per acre of Balsam Fir and White Spruce only), the Balsam/White Spruce ratio, stand area and vigour. The tables are based on research in the Northeast and Canada, and on data from Minnesota.

4164. BLAIS, J. R., and MARTINEAU, R. **Spruce budworm defoliation and egg-mass survey in Lower St. Lawrence and Gaspé Peninsula—1955.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (2), 1956 (2–3).

Gives an account of (1) a visual reconnaissance from aircraft in order to assess defoliation of current growth, and (2) a Spruce budworm egg-mass survey as a basis for forecasting the 1956 budworm situation.

4165. BLAIS, J. R. **Aerial spraying against the Spruce budworm in Quebec, 1955.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (1), 1956 (1).

A total of 1,040,000 acres were sprayed in 3 districts in 1955. The operation was generally successful as regards the amount of the current year's foliage saved and the relatively large numbers of Spruce budworm destroyed. The areas sprayed in 1954 showed very good recovery in 1955, with low insect populations and the retention of a good portion of the current year's foliage.

4166. WEBB, F. E. **Aerial spraying against Spruce budworm in New Brunswick—1955.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (2), 1956 (1–2).

During the year, the 4th annual operation involved an acreage of 1,100,000 acres, about ¼ of which was respraying. Net acreage treated to date is 3,600,000. Study of results has shown that survival of Spruce budworms at adult emergence was reduced by 83% when data from all sprayed areas were compared with those from check areas. An average of 70% of current foliage remained in sprayed areas compared with 30% in unsprayed.

4167. WEBB, F. E. **Four years of aerial spraying against Spruce budworm in New Brunswick.** *Repr.* from *Pulp Paper Mag. Can.* 56 (13), 1955 (132–5). 3 refs. (*Contr. Div. For. Biol. Dep. Agric. Can.* No. 261.)

Extends for an additional year the information already noticed. [See *For. Abstr.* 16 (pp. 453–65); 17 (pp. 3–9; 149–59).]

4168. MCCAMBRIDGE, W. F. **Effects of black-headed budworm feeding on second-growth Western Hemlock and Sitka Spruce.** *Proc. Soc. Amer. For. 1955*, 1956 (171–2).

A heavy attack by *Acleris* [*Peronea*] *variana* on *Tsuga heterophylla* and *Picea sitchensis* in S.E. Alaska has been studied. The reduction in radial growth that has occurred appears to be independent of budworm damage. In most cases where tree tops were killed, both species appear to be forming new leaders.

4169. **[The black-headed budworm.]** *Sta. Pap. Alaska For. Res. Cent.* No. 2, 1955 (26–9). (*Rep. Alaska For. Res. Cent. 1954.*)

Results of a survey in 1954 suggest that the outbreak in S.E. Alaska is drawing to a close and that Western Hemlock forests that have suffered heavy defoliation should recover and gradually regain their growth. Low mean maximum temperatures in May–July 1954 are believed to have contributed to a delay of one month in budworm development. One year's heavy defoliation in advanced regeneration caused top kill in 81% of dominants, 71% of co-dominants and 23% of intermediates of Western Hemlock, and 86% of dominants, 71% of co-dominants, 71% of intermediates and 29% of suppressed trees of Sitka Spruce. Heavy, but not extreme, damage to mature Western Hemlock stands caused top kill in 21% of the co-dominants and 14% of the intermediates. Many of the tops were broken or forked before the present infestation, probably as a result of previous budworm damage. Small-scale tests show that 4% nicotine sulphate and 2% 'Kleenup Soluble' give a satisfactory kill; practical field tests are needed. Hymenopterous and dipterous parasites continued to give control of the epidemic; disease was not a significant control factor in 1954.

4170. PATOČKA, J. Obal'ovač jedl'ový vážny škodca jedlín na Slovensku. **[*Cacoecia murinana*, an important pest of *Abies alba* in Slovakia.]** *Les, Bratislava* 2 (5), 1955 (184–91). 9 refs. [Slovak.]

Illustrated description of the pest, its life cycle, factors contributing to mass outbreaks, and economic importance. Preventive measures should include, besides improvement of the health of *A. alba* stands, an increase in the population of insectivorous birds and bats (nest boxes, retention of hollow trees). Chemical control (with DDT) should be applied, in the first place, to larvae at the moment when they leave their hibernation quarters to penetrate into the opening buds (April); the dusting must be completed within 3–4 days. Good results (an 80% kill) were obtained in 1954 with a motor dusting apparatus. DDT is less efficacious against the older instars. Several methods developed by the author to assess the efficacy of chemical control and facilitate a prognosis of the outbreak in the following year are described.

4171. WEISER, J. Die Krankheiten des Tannentriebwicklers, *Cacoecia murinana* Hb. in der Mittelslowakei (ČSR). **[Diseases of *C. murinana* in central Slovakia.]** *Z. PflKrankh.* 63 (4), 1956 (193–7). 6 refs. [G.g.e.] [Laboratorium für Insektenpathologie, Biologisches Institut der Akademie der Wissenschaften, Prague.] E.M.B.

A study of material from some 10,000 ha. of Silver Fir forest near Zarnovica, suffering from a mass outbreak of the insect, showed that ca. 37% of the 481 larvae examined were attacked by disease and 2% by parasites and predators and that 28% were infected by viruses (23% by a granulosis, *Bergoldia calypta*, and 5% by a polyhedrosis described for the first time), 9% by fungi (*Beauveria bassiana* and *B. globulifera*), bacteria (*Pseudomonas* sp., strain CM 48) or protozoa (*Nosema cacoeciae* sp. nov. and *N. musinanae* sp. nov.). These results, however, are not from characteristic material. [Cf. *For. Abstr.* 15 (No. 1580).]

4172. **Oak leaf roller moth [*Tortrix viridana*.]** *Leafl. For. Comm., Lond.* No. 10 (rev.) 1956. pp. 7.

Notes on life history, hosts, forest relations, and natural control.

4173. KALANDRA, A., KUDLER, J., and KOLUBAJIV, S. Poprašování a zamlžování v boji proti hromadnému přemnožení obaleče dubového *Tortrix viridana* L. v ČSR v r. 1953.] **[Dusting and mist-spraying in the control of the mass outbreak of *T. viridana* in Czechoslovakia in 1953.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 28 (3), 1955 (325–54). 21 refs. [Cz.cz.russ.g.]

Five % Dynocide (DDT) was dusted from aircraft on to Oak stands at the rate of 25–35 kg./ha. from 15 to 19 Apr., 1953. Over 90% of early instars of *Tortrix viridana* and the associated *Apethymus* spp. and *Cheimatobia brumata* were killed. Similar results were obtained from a large-scale dusting in Moravia in 1954. First trials of aerosol fogs used oil emulsions of DDT and BHC (5 and 10%) and E605 (unspecified), at 1 kg./ha. from aircraft and 3–5 for ground atomizers. Best results (> 90% larval kill of *T. viridana*) were obtained with the 10% DDT thermo-mechanical aerosol applied from ground level. This finding was also confirmed in 1954.

4174. OSSOWSKI, L. L. J. **A guide to the assessment of Wattle bagworm infestations.** South African Wattle Growers' Union, P.O. Box 225, Pietermaritzburg. 1956. pp. 8 + 8 plates.

Describes the insect and its habits, seasonal development, and course of infestation, and discusses the assessment of degrees of infestation, with colour photographs of stands illustrating 7 degrees from very light to virtually complete defoliation.

4175. ZIA-UD-DIN, K. **On the biology of the bark-eating borer.** *Pakistan Journal of Science, Lahore* 6 (1), 1954 (22–30). 11 refs. C.G.B.

Indarbela quadrinotata inflicts damage on smooth-barked forest trees and many fruit trees in Pakistan, India, Burma and Ceylon, by boring shelter tunnels in the sapwood and feeding on the bark. Both larvae and adults show a definite preference for *Albizzia procera*, and this tree might be used as a trap in heavily infested plantations or orchards. Observations are presented on the life-history and habits of the pest. [Cf. *For. Abstr.* 5 (285); 11 (No. 738).]

4176. SZMIDT, A. Możliwości wykorzystania pasożytów rodzaju *Apanteles* Först do biologicznego zwalczania barczatki sosnówki (*Dendrolimus pini* L.). **[Possibilities of utilizing parasites of the genus *Apanteles* for the biological control of *D. pini*.]** *Sylwan* 99 (6), 1955 (490–500). 10 refs. [Pol.russ.e.]

Describes laboratory methods of mass breeding of imagos of the *Apanteles* spp. that parasitize *D. pini* larvae. Large parasite populations can thus be introduced into the affected area within one growth period.

4177. IMAZEKI, R., and KOYAMA, R. **Periodical outbreaks of *Dendrolimus spectabilis* Butler and natural control by *Isaria farinosa*.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/24/9, 1956. pp. 1 + 3 gphs. [Government Forest Experiment Station, Tokyo.]

Describes the natural control of outbreaks of this insect pest of *Pinus thunbergii* by a fungal disease.

4178. FROELICH, R., SHIUE, C.-J., DUNCAN, D. P., and HODSON, A. C. **The effect of rainfall on the basal area growth of Aspen as related to defoliation by the forest tent caterpillar [*Malacosoma disstria*].** *Minn. For. Note* No. 48, 1956. pp. 2.

The annual growth of *Populus tremuloides* has been shown [cf. *For. Abstr.* 16 (No. 695); 17 (No. 1794)] to undergo large reductions with increasing intensity of defoliation by *Malacosoma disstria*. A major variable that might have contributed to the relationship, however, was rainfall, and the object of the present study was to ascertain the influence of the sum of April, May, June, and July precipitation on basal-area growth of Aspen, both in years preceding defoliation and in years of defoliation. Although a significant relation was found to exist between b.a. growth and summer rainfall in non-defoliation years, no such significant correlation was found in defoliation years though the range of precipitation was about the same. This finding leads to the rejection of the hypothesis that rainfall has been the dominant contributing factor to the growth reduction that has accompanied defoliation. It is estimated that 72% of reduction in b.a. increment in the first year of heavy defoliation, and 87% in the second year, is the direct work of the caterpillar.

4179. SCHWENKE, W. Beiträge zur Bionomie der Kiefernspanner *Bupalus piniarius* L. und *Semiothisa liturata* Cl. auf biozönotischer Grundlage. **[The bionomics of *B. piniarius* and *S. liturata* on a biocoenotic basis.]** *Beiträge zur Entomologie, Berlin* 3 (1/2), 1953 (168–206). 25 refs. [G.g.] I.I.E.

Gives data on various aspects of the life cycle, pupal weights and their relation to egg numbers, distribution of sexes etc. for both species, partly from literature and partly from the author's laboratory and field observations. The latter in particular are analysed in the light of the differences of the forest types where they were collected. [Cf. *For. Abstr.* 15 (Nos. 1584, 2686).]

4180. SCHWERDTFEGER, F. Zum Begriff der Populationsdynamik. **[The concept of population dynamics.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/24/16, 1956. pp. 3. [G.]

Discusses the factors involved in the concept (e.g. abundance, dispersion, sex ratio, morbidity etc.), taking a population of *Bupalus piniarius* as an example.

4181. NOSEK, J., and POVOLNÝ, D. Významný škůdce modřínu *Poecilopsis isabellae* Harr. **[*P. isabellae* as a pest of Larch.]** *Zool. ent. Listy* (*n.s.*) 3 (1), 1954 (13–36 + 4 plates). 82 refs. [Cz.russ.g.] I.I.E.

A study, made in connexion with the occurrence of this pest in central Moravia, of its taxonomic relationships, life cycle, and ecology, with special reference to distribution in Czechoslovakia and elsewhere. The pupae are very sensitive to over-dry or over-moist conditions, and the *Querceto-carpinetum* with a high proportion of Larch is more favourable to attack than pure Larch. DDT is effective against larvae, and ♀ imagos can be destroyed by banding. Brief notes are also included on some other Bistonini, especially *Amphidasis betularia* on Oak near Brno.

4182. WEISER, J., and VEBER, J. Možnosti biologického boje s přástevníčkem americkým (*Hyphantria cunea* Drury). **[Possibilities of biological control of *H. cunea*.]** *Zool. ent. Listy* (*n.s.*) 3 (1), 1954 (55–68). 8 refs. [Cz.russ.e.] I.I.E.

Describes the authors' studies of 1953, in which none of the bacteria or virus diseases tested was sufficiently pathogenic to *H. cunea*. The microsporidian *Thelophania hyphantriae*, however, found in the fat-body of some larvae, offers considerable promise. Its spores are infective even after 2 months' storage in dried, dead larvae under a variety of conditions. The course of the disease is described. *T. hyphantriae* does not appear to be pathogenic to *Bombyx mori*.

4183. BOUČEK, Z., and ŠEDIVÝ, J. Blanokřídlí cizopasníci přástevníčka amerického (*Hyphantria cunea* Drury) v Československu. **[Hymenoptera parasitic on *H. cunea* in Czechoslovakia.]** *Zool. ent. Listy* (*n.s.*) 3 (3), 1954 (169–89). 37 refs. [Cz.russ.g.] I.I.E.

Describes and gives a key to the hymenopterous parasites of *H. cunea* so far found in Czechoslovakia, with notes on their biology. None of them is likely to be usable in deliberate biological control, though collectively they destroy > 10% of the pupae of *H. cunea* under natural conditions.

4184. WEISER, J., LUDVÍK, J., and VEBER, J. Polyedrie bekyné vrbové (*Stilpnotia salicis* L., Lepidoptera). **[Polyhedral disease of *S.* [*Leucoma*] *salicis*].** *Zool. ent. Listy* (*n.s.*) 3 (4), 1954 (238–42 + plate). 8 refs. [Cz.russ.g.] I.I.E.

Describes a new polyhedral virus found in *L. salicis* in S. Slovakia, 1953, under the name *Bollea stilpnotiae.* In infection tests, several other species of Lepidoptera appeared to be immune to this virus, but 2 out of 32 larvae of *Bombyx mori* were infected.

4185. GRISON, P. La lutte contre les ennemis des forêts de chênes-lièges. **[The control of enemies of Cork Oak forests.]** *Rev. int. Bois* 23 (215), 1956 (85, 87). [F.]

Discusses the natural control of *Lymantria dispar* in the Mediterranean area, and describes the dramatically sudden control of a severe outbreak in 1954 by an exceptional proliferation of the predator *Calosoma sycophanta.*

4186. DREES, H., and SCHWITULLA, H. Über Parasitierungs-Versuche bei *Lymantria dispar* L. mit *Apanteles solitarius* Ratz. W. **[Trials in parasitizing *L. dispar* with *A. solitarius*.]** *Anz. Schädlingsk.* 29 (6), 1956 (81–5). 18 refs. [G.g.]

Trials were made, in an experimental orchard, in the control of an outbreak of *L. dispar* by building up a population of the braconid parasite *A. solitarius.* Within 3 years a biological equilibrium was achieved in which *L. dispar* no longer inflicted damage of economic importance. The optimum biotope for *A. solitarius* is that part of the stem facing S.E., both because this is the habitat preferred by the emerging larvae of *L. dispar*, and because of the parasite's restricted flight range.

4187. SISOJEVIĆ, P. Prilog poznavanju tahina gubara u Jugoslaviji. **[Diptera parasitic on *Lymantria dispar* in Jugoslavia.]** *Suppl.* to *Zašt. Bilja* No. 28, 1955. pp. 10. 9 refs. [Croat.g.] [Institut za Ekologiju i Biogeografiju SAN, Beograd.] I.M.I.

In studies on two sites (bottomland Poplar/Willow and an Oak stand) in 1950, 13 species of parasitic Diptera were found on *L. dispar.* Differences in the composition of the parasite fauna of the two sites are discussed, with notes on the biology of the individual species (Tachinidae and Sarcophaginae), and parasitic Diptera so far recorded on *L. dispar* in Jugoslavia are listed.

4188. LAZAREVIĆ, B. Dejstvo nekih organskih insekticida na gusenice gubara. **[The effect of some organic insecticides on larvae of *Lymantria dispar*.]** *Zašt. Bilja* No. 28, 1955 (55–62). 2 refs. [Croat.e.] [Institut za Zaštitu Bilja, Beograd.] I.M.I.

Reports on small-scale laboratory and field tests of 4 DDT preparations, of which 'Pantakan 16·5%' gave best results, and two [γ?] BHC preparations—'Lindan OM15' and 'Xexyclan 7%'—of which the former was considerably more effective in the field, and the latter lightly better in the laboratory tests. No significant difference in susceptibility to these insecticides was found between second- and third-instar larvae.

4189. DŽUTEVSKI, B. Akcija suzbijanja gubara u NR Makedoniji u 1953/54 godini. **[The [aerial] control operation against *Lymantria dispar* in Macedonia in 1953/54.]** *Zašt. Bilja* No. 28, 1955 (99–105 + 1 plate). [Croat.e.] [Uprava za Zaštitu Bilja, Skopje.] I.M.I.

On 15–18 May, 1954, foci of infestation in Đevđelija district totalling ca. 2700 ha., chiefly in dense *Quercus coccifera*, were mist-sprayed with 33% DDT emulsion at a mean rate of 2 kg./ha. Results [no quantitative data given] were excellent. [Cf. *For. Abstr.* 17 (No. 3045).]

4190. HAŽISTEVIĆ, D., and TOMIĆ, D. Rezultati avio-suzbijanja gubara na području Istočne Srbije u 1954 godine. **[Results of aerial operations against *Lymantria dispar* in Eastern Serbia in 1954.]** *Zašt. Bilja* No. 29, 1955 (99–108). [Croat.e.] I.M.I.

Describes an operation (18 May–10 June) using a Hiller 360 helicopter to apply 16·5% DDT at a mean rate of 3·4 litres/ha. on 902 ha., chiefly on open Oak scrub, and examines various reasons for its unsatisfactory results.

4191. ZEČEVIĆ, D. Zimska ishrana i razviće gubara pod laboratoriskim uslovima 1952–53. **[Winter feeding and development of *Lymantria dispar* under laboratory conditions in 1952–53.]** *Zašt. Bilja* No. 28, 1955 (3–20). 12 refs. [Croat.e.] I.M.I.

The experiments, reported in detail, suggest that a period of low temperatures and a long diapause may not be necessary for the completion of development, thus raising the question whether suitable conditions of climate and nutrition could give two generations in a year.

4192. SUOMALAINEN, E. Neueres über das Vorkommen der Nonne, *Lymantria monacha* L. (Lep., Lymantriidae) in Finnland. **[Recent investigations into the occurrence of *L. monacha* in Finland.]** *Annales Entomologici Fennici, Helsinki* 19 (2), 1953 (52–6). 1 ref. [G.] I.I.E.

A short survey of the occurrence of the pest over the years 1951 and 1952 [cf. *For. Abstr.* 15 (No. 1072)].

4193. KOCH, M. Zur Biologie des Kiefern-prozessions-spinners *Thaumatopoea pinivora.* **[The biology of *T. pinivora*.]** *Beiträge zur Entomologie, Berlin* 3 (4), 1953 (423–7). 12 refs. [G.] I.I.E.

According to the author's observations and breeding experiments, the larvae hatch in April/May and pupate from July onwards; the imagos emerge and lay their eggs the following July or August. Sometimes the life cycle takes 3–4 years. The conflicting accounts in the literature are discussed.

4194. VAGO, C. La polyédrie de *Thaumetopoea pityocampa.* **[Polyhedral disease of *T. pityocampa*.]** *Annales des Épiphyties, Paris* (*n.s.*) 4 (3), 1953 (319–32). 18 refs. [F.f.] O.R.E.

Larvae from different parts of France were found to be infected. The disease, due to an ultravirus of the polyhedral type, could be transmitted by inoculation or *per os*. Latent stages may become acute under certain weather conditions. Research into the role of the disease in regulating the numbers of the insect continues [cf. *For. Abstr.* 15 (No. 1590)].

4195. ANDROIĆ, M., and SERAFIMOVSKI, A. Smrdljikin četnjak (*Thaumetopoea solitaria* var. *iranica* Bang-Hass), dosad nepoznati štetnik u našoj zemlji. **[*T. solitaria* var. *iranica*, a pest hitherto unknown in Jugoslavia.]** *Zašt. Bilja* No. 29, 1955 (63–6). 4 refs. [Croat.f.] I.M.I.

Notes on the morphology and biology of this pest, found on *Pistacia terebinthus* in southern Macedonia in 1954.

Coleoptera

See also Nos. 3609–10, 3879–80, 3900, 4098–9, 4145, 4259.

4196. MARICONI, F. A. MENEZES. Alguns besouros depredadores de eucaliptos na região de Piracicaba. **[Coleoptera attacking Eucalypts in the region of Piracicaba.]** *Biológico* 22 (1), 1956 (1–14). 44 refs. [Port.] C.G.B.

Hosts, range, biology, and control with reviews of literature. Species dealt with are: *Bolax flavolineatus*, *Costalimaita ferruginea*, *Colaspis quadrimaculata*, *Pantomorus xanthographus* and *Sternocolaspis quatuordecimcostata*.

4197. DEFNE, M. Zelzelenin orman entomolojisi bakımından solü ve zelzeleden sonra ormanda yapılması gereken işler. **[The importance of earthquakes in forest entomology and subsequent protective measures.]** *Istanbul Üniv. Orm. Fak. Derg.* 4*A* (1/2), 1954 (29–37). 5 refs. [Turk.g.]

Earthquake-damaged trees in the Pine/Fir/other-species forests of Götschek-Soyak were salvaged in 1944. In 1947, damaged and unhealthy trees infested with insects were still standing. Their roots, in thin wet soil, had been loosened by the shock, or dried out through fissuring, and their crowns had become interlocked. Five species of insect attacking the Pine and 4 attacking Fir are named. After such shocks damage should be more precisely determined and the trees immediately salvaged or at least barked.

4198. VITÉ, J. P. Grundsätzliche Möglichkeiten in der Behandlung des Sturmholzes bei Anwendung moderner Insektizide. **[Basic possibilities in the treatment of windthrown timber with modern insecticides.]** *Anz. Schädlingsk.* 29 (4), 1956 (58–60). [G.]

The most promising protection of windthrown trees against borer attack was obtained with the BHC preparation 'Mobe-T' (Merck, Darmstadt) painted, or preferably sprayed, on to the stems at a rate of ca. 6–10 litres/cu.m. [Cf. *For. Abstr.* 17 (No. 641).]

4199. **Residual-type sprays show promise for controlling bark beetles.** *Rep. Calif. For. Range Exp. Sta. 1955* [1956] (49–51).

In tests on the concentrations of 8 chemicals needed to kill 90% of the test insects, lindane [γBHC], Isodrin [an isomer of aldrin], endrin and EPN proved very much more powerful than DDT. Western Pine beetle, California flat-headed borer, mountain Pine beetle and Fir engraver beetle differed widely in their resistance to DDT and Isodrin, the last being the most susceptible; all were more susceptible to Isodrin than to DDT.

4200. RUMMUKAINEN, U. Beobachtungen über die Bedeutung des Fichtenzapfennagekäfers, *Ernobius abietis* F. (Col., Anobiidae) als Fichtenzapfennageschädling. **[The importance of *E. abietis* as a pest of Spruce cones.]** *Annales Entomologici Fennici, Helsinki* 20 (2), 1954 (69–75). 11 refs. [G.g.] I.I.E.

A survey over the years 1951–53 in a large number of localities in Finland, showed that *E. abietis* occurs mainly in the south; north of lat. 64° it practically disappears. The pest is found exclusively in old cones. The larvae precipitate cone-fall by boring into the base of the cone. [Cf. *For. Abstr.* 14 (No. 2475).]

4201. ALLEN, R. M., and COYNE, J. F. **Insect problems in forest-tree genetics.** *J. For.* 54 (3), 1956 (193). 1 ref.

Spraying with 0·5% BHC in water emulsion in March, immediately after removing the pollination bags, and in April, June and August, afforded considerable protection to first-year cones of *P. palustris* and *P. elliottii*, which suffer damage attributed to the beetle *Ernobius granulatus* and to a less extent a Pitch moth *Dioryctria amatella*. A pollen eater, bark weevils and a beetle attacking seed trees, seedlings and grafts, some of which have been controlled with BHC, are mentioned.

4202. **Insects of *Nothofagus*.** *Rep. For. Res. Inst. N.Z. For. Serv. 1954/55*, 1955 (15–6).

The buprestid *Nascioides enysii* [cf. *For. Abstr.* 12 (No. 1590)] is increasing in the *Nothofagus* forests of the N.E. of South Island and is associated with considerable mortality in thinned and partially windthrown pole stands. A preliminary survey indicated that *N. enysii* was a secondary pest, favoured by a series of factors predisposing the stands to attack, not only those associated with an alteration in the microclimate through sudden exposure, but also changes in soil conditions brought on by drought and the rotting of stumps of the former high-forest trees. The fungus *Armillaria mellea* and browsing by deer are also possible influences.

4203. DUDA, E. J. **An observation on the Locust leaf miner [*Chalepus dorsalis*].** *Sci. Tree Topics* 2 (3), 1956 (20).

Following very heavy infestations of Robinia by this insect at Pittsburgh in 1955, the adult leaf miners were driven to seek other species on which to feed. A photograph is given of the type of injury caused to Red Oak leaves, in which only the cuticle and upper epidermis are destroyed.

4204. BECKER, G. Beobachtungen über Eier und Eiablage einiger holzfressender Cerambyciden. **[The eggs and oviposition habits of some wood-eating cerambycids.]** *Beiträge zur Entomologie, Berlin* 3 (5), 1953 (504–18). 29 refs. [G.g.] I.I.E.

Describes the eggs, the appearance and size of clusters, the number of clusters produced, general fertility etc. of a number of species (mostly conifer parasites) partly from literature, partly from the author's laboratory observations. Fertility varies from 30 for *Gracilia minuta* to 400–500 for *Leptura rubra*.

4205. STEVENSON, N. S. ***Pachydissus camerunicus* Aurivilliers.** *Inform. Bull. For. Dep. Nigeria* No. 23, 1955. pp. 4.

Describes the insect and its life history and the nature of damage to *Daniella oliveri*. Other host plants are *Antrocaryon micraster* and *Lannea acidissima*. Attack can be recognized in the early stages by the exudation of gum from the point of attack and finally by the large vertical slot-like exit holes of the adults followed by death of the tree.

4206. SCHNAIDEROWA, J. O zwalczaniu rzemlika topolowca (*Saperda carcharias*). **[Control of *S. carcharias*.]** *Sylwan* 99 (1), 1955 (74–6). [Pol.]

Tests conducted in a × *Populus robusta* plantation with different stomach and contact insecticides (10% DDT dust, 8% BHC dust, *p*-dichlorobenzene, Azotox M_{25} emulsion, Silvexol, Wofatox, Arsopul, Na_2SiF_6, Ring Detexol) showed that Ring Detexol spray gave by far the best results, not only killing the larvae but also preventing egg-laying. A spraying rate of ca. 150 litres/ha. for 2 × 2-m. spacing is suggested.

4207. LEILER, T.-E. *Xylotrechus pantherinus* Sav., ein Schädling der Salweide (*Salix caprea* L.). **[*X. pantherinus*, a pest of *S. caprea*.]** *Entomologisk Tidskrift, Stockholm* 75 (2/4), 1954 (171–5). 5 refs. [G.] O.R.S.

Describes the insect's life history and the nature of the damage to bark and wood.

4208. SCHWERDTFEGER, F. Cerambycidae (Col.) an *Pinus*-Arten in Guatemala. (3. Beitrag zur Forstentomologie Mittelamerikas.). **[Cerambycidae on *Pinus* species in Guatemala. (3rd contribution to the forest entomology of Central America.)]** *Z. angew. Ent.* 37 (3), 1955 (315–22). 7 refs. [G.]

Short notes on the species found to date in Guatemala.

4209. SCHWERDTFEGER, F. Curculionidae (Col.) an *Pinus*-Arten in Guatemala (2. Beitrag zur Forstentomologie Mittelamerikas.). **[Curculionidae on *Pinus* species in Guatemala. (2nd contribution to the forest entomology of Central America.)]** *Repr.* from *Z. angew. Ent.* 36 (2), 1954 (178–84). 11 refs. [G.]

Short notes on the species found to date in Guatemala.

4210. FINNEGAN, R. J. **Weevils attacking Pines in Southern Ontario.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (2), 1956 (3).

Brief notes on *Pissodes approximatus*, *Hylobius pales*, and *H. radicis*, which infest Christmas-tree plantations in S. Ontario. The first two breed in stumps and damage is confined to feeding by adults on tender bark; *H. radicis* attacks healthy trees, breeding in the root-collars.

4211. WARREN, G. L. **Root injury to conifers in Canada by species of *Hylobius* and *Hypomolyx* (Coleoptera: Curculionidae).** *For. Chron.* 32 (1), 1956 (7–10). 6 refs. (*Contr. Div. For. Biol. Dep. Agric. Can.* No. 249.)

Deals mainly with *Hylobius radicis* and *Hypomolyx piceus*, their range and damage, and methods of control.

4212. WRIGHT, K. H., and BAISINGER, D. H. **The silvicultural importance of the Sitka Spruce weevil [*Pissodes sitchensis*] in coastal Oregon and Washington.** *Proc. Soc. Amer. For. 1955*, 1956 (64–7). 2 refs.

Preliminary results of a study now in progress indicate that Hemlock will eventually dominate Sitka Spruce in Youngs River plantation, Oregon. From its measured effect on height growth, *Pissodes sitchensis* appears to be the principal cause. There seems to be a correlation between the intensity of weevil attack and distance of Spruce from the coast, stands within the coastal fog belt being relatively unaffected.

4213. BELYEA, R. M., and SULLIVAN, C. R. **The White Pine weevil [*Pissodes strobi*]: a review of current knowledge.** *For. Chron.* 32 (1), 1956 (58–67). 20 refs. (*Contr. Div. For. Biol. Dep. Agric. Can.* No. 248.)

A conference paper with literature references.

4214. BRAY, D. F. **The Asiatic Oak weevil [*Cyrtepistomus castaneus*].** *Sci. Tree Topics* 2 (3), 1956 (21–2).

This insect, a native of Japan, has spread rapidly in the eastern U.S.A. and is causing severe damage to the foliage of all species of Chestnuts and Oaks. Damage is caused by the adult weevils, which eat from the edge towards the centre, leaving only the larger veins intact. The larval stages have been found in close association with Red Oak roots, but it is not known how they feed.

4215. BRAY, D. F. **A weevil injurious to Sassafras.** *Sci. Tree Topics* 2 (3), 1956 (15).

A note on *Odontopus* (= *Prionomerus*) *calceatus*, which feeds on young leaves of *Sassafras albidum*.

4216. FRANCKE-GROSMANN, H. Über die Brutfürsorge einiger an Kulturweiden lebender triebstechender Rüssler (Curculionidae) und ihre phytopathologische Bedeutung. **[The phytopathological significance of the manner in which certain shoot-puncturing curculionids living on cultivated Willows care for their progeny.]** *Beiträge zur Entomologie, Berlin* 3 (5), 1953 (468–78). 14 refs. [G.] I.I.E.

Of the weevils found on Willows at Reinbek and near Bremen (*Balanobius salicivorus*, *B. crux*, *Rhynchaenus stigma*, *R. salicis*, *Merhynchites tomentosus*, *M. longiceps*, *M. nanus*, and *M. germanicus*), the *Balanobius* spp., are harmless, the *Rhynchaenus* spp. cannot seriously damage the vigorous shoots of cultivated Willows, but the *Merhynchites* can do considerable injury, as they either cut off, or 'girdle', and cause to wilt, the tips of the shoots in which they lay their eggs. The behaviour and life history of these species is described. [Cf. *For. Abstr.* 9 (No. 2559).]

4217. OHNESORGE, B. Der Einfluss von Geruchs- und Geschmacksstoffen auf die Wahl der Frasspflanzen beim grossen braunen Rüsselkäfer *Hylobius abietis* L. **[The influence of substances with smell and taste on the choice of food plants of *Hylobius abietis*.]** *Beiträge zur Entomologie, Berlin* 3 (5), 1953 (437–68). 23 refs. [G.g.] I.I.E.

Laboratory experiments showed that extracts of conifer bark and phloem contained ether-soluble substances that attracted the beetles. The attraction was greatest in Pine, followed by Spruce, Fir, Douglas Fir and *Tsuga heterophylla* in that order. Extracts from the phloem of hardwoods and from Spruce needles and also certain chemical substances, e.g. formaldehyde and acetic acid, were also attractants to a lesser degree. Conifer resins acted as repellents. The beetles were guided to their source of food by smell, but intensity and duration of feeding depended on taste. They were able to distinguish between sugar solutions in concentrations much lower than those of their natural foods.

4218. GRAHAM, K., and WERNER, A. E. **Chemical aspects of log selection by ambrosia beetles.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (1), 1956 (3–4).

On the assumption that it is the specific odour of sapwood that attracts different species of ambrosia beetle to their proper hosts, the authors set about devising methods (*a*) to extract the odoriferous compound from the wood, (*b*) for biological testing, and (*c*) for fractionation of the compound into its individual constituents. These methods are described in some detail.

4219. MERKER, E. Die Abhängigkeit der Waldverderber von ihrer Frasspflanze. **[The dependence of forest pests on their food plants.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/24/13, 1956. pp. 6. 2 refs. [G.]

Discusses, with particular reference to *Ips typographus*, the factors determining the choice of trees or stands for attack, e.g. attractants in the sap or bark, physiological condition of the tree etc.

4220. NOVÁK, V. Příspěvek k poznáni účinnosti HCH na lýkožrouta smrkového. **[Effect of BHC on *Ips typographus*.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 28 (3), 1955 (355–74). 16 refs. [Cz.cz.russ.g.]

Imagos of *I. typographus* (all stages) were dusted with 12% BHC (0·17, 0·25 and 0·50 kg./cu.m. of trap-trees) and transferred to uncontaminated surroundings. The beetle is first irritated and tries to escape into, or between pieces of, bark. This results in the mechanical removal of the poison, and a 100% kill is thus delayed by 4–5 days (up to 8 days when the beetle bores into the bark). Beetles of brighter colour were, as a rule, slightly more resistant than darker ones.

4221. NOVÁK, V., and FLEK, J. Toxický účinek arsenu na lykožrouta smrkového *Ips typographus* L. **[The toxic action of arsenic upon *I. typographus*.]** *Zool. ent. Listy* (*n.s.*) 3 (4), 1954 (288–94). 13 refs. [Cz.russ.g.] I.I.E.

Studies were made on *I. typographus* in healthy trees of Spruce that had been ring-barked as in Lekander's work [see *For. Abstr.* 14 (No. 509)], using Na arsenite as the poison, and either left standing or cut into trap logs. Careful study of galleries showed that only ca. 20% of the beetles were killed inside the poisoned inner bark, the remainder leaving the distasteful environment. Field and laboratory investigations with respect to the latter, ca. 35% of which were ♀s that had not completed egg-laying, showed that many, having consumed a sublethal dose of As, were gradually weakened and died after 6–10 days. Such dead beetles contained 0·00007–0·00008 mg. As per body. To determine the full lethal dose, colorimetric analyses were made by Vašák and Šedivy's method, of the As content of dead beetles in the bark, and of the bark itself. The lethal dose was found to lie within the range 0·0002–0010 mg. As per beetle, or 0·003–0·013% As_2O_3 based on the body weight. Results are shown in tables and a graph. It is noted incidentally that the larvae also perished sooner or later. With one exception, the As contents of the inner bark lay between 0·045 and 0·269 mg./g.

4222. SCHNAIDER, Z., and SIERPIŃSKI, Z. Z biologii kornika zrosłozębnego (*Ips duplicatus* Sahlb.). **[Biology of *I. duplicatus*.]** *Roczn. Nauk leśn.* No. 13, 1955 (59–68). 26 refs. [Pol.pol.russ.e.] (*Prace Inst. bad. Leśn.* No. 147.)

Laboratory and field observations showed that the life cycle of *I. duplicatus* in N.E. Poland can last 1 or 2 years, according to atmospheric conditions. In warm dry years, all trees showing traces of frass should be removed throughout the growing season. The adult insect hibernates in forest litter.

4223. STRUBLE, G. R. **California five-spined engraver beetle [*Ips confusus*].** *For. Pest Leafl. U.S. For. Serv.* No. 4, 1955. pp. 4. 2 refs.

4224. GODWIN, G. E. **A major threat to Sitka Spruce?** *Quart. J. For.* 50 (2), 1956 (119–23).

Dendroctonus (*Hylesinus*) *micans* has spread alarmingly in Sitka Spruce in Denmark since 1947 and killed whole plantations. It is as yet unknown in Great Britain, but its nearness gives some grounds for apprehension.

4225. JUUTINEN, P. Ukkoniluri (*Dendroctonus micans* Kug.) (Col., Scolytidae) okakuusessa (*Picea pungens* Engelm.) **[*D. micans* on *P. pungens*.]** *Annales Entomologici Fennici, Helsinki* 19 (1), 1953 (35). 1 ref. [Fi.e.] I.I.E.

Reports *D. micans* on *P. pungens* at Punkaharju in 1951, the first appearance in Finland of *D. micans* on living trees.

4226. SCHWERDTFEGER, F. Informe al Gobierno de Guatemala sobre la entomologia forestal de Guatemala. Volumen II. La plaga de *Dendroctonus* en los bosques de pinos y modo de combatirla. Con un anexo por G. Becker. **[Report to the Guatemala government on the forest entomology of Guatemala. Vol. II. The *Dendroctonus* infestation of the Pine forests and methods of controlling it. With an appendix by G. Becker.]** FAO, Rome.

No. *FAO/ETAP* 366, 1955. pp. 63 + 9 plates. 43 refs. [Span.] Limited distribution.

Presents the results of observations made from May 1951 to April 1952 on the Guatemalan species, their life history, the nature of attack and the history of infestations in Guatemala, with suggestions for prevention and control. The appendix includes information on the density of infestations by *Dendroctonus adjunctus* in individual trees, the distribution of insects in the stem, enemies and parasites, and the succession of insect species in dead and dying Pines.

4227. WRIGHT, E., COULTER, W. K., and GRUENFELD, J. J. **Deterioration of beetle-killed Pacific Silver Fir [*Abies amabilis*].** *J. For.* 54 (5), 1956 (322–5). 7 refs.

Nearly 2000 million bd. ft. of timber killed by an outbreak of barkbeetle awaits salvage. Studies of deterioration through decay showed that the annual rate was 5% of total cu. ft. volume for each of the first 4 years after death. Pulping tests showed definite decreases in quantity and quality of screened pulp from trees dead > 2 years.

4228. KEEN, F. P. **The western Pine beetle [*Dendroctonus brevicomis*].** *For. Pest. Leafl. U.S. For. Serv.* No. 1, 1955. pp. 4. 1 ref.

4229. STRUBLE, G. R., and JOHNSON, P. C. **The Mountain Pine beetle [*Dendroctonus monticolae*.]** *For. Pest Leafl. U.S. For. Serv.* No. 2, 1955. pp. 4. 1 ref.

4230. EVENDEN, J. C., and WRIGHT, K. H. **Douglas-Fir beetle [*Dendroctonus pseudotsugae*].** *For. Pest Leafl. U.S. For. Serv.* No. 5, 1955. pp. 4. 2 refs.

4231. WEAR, J. F., and LAUTERBACH, P. G. **Color photographs useful in evaluating mortality of Douglas Fir.** *Proc. Soc. Amer. For. 1955*, 1956. (169–71).

Briefly describes two studies which demonstrated the superiority of colour to panchromatic [monochrome] photography for assessing mortality due to *Dendroctonus pseudotsugae*.

4232. MASSEY, C. L. **Nematode parasites and associates of the Engelmann Spruce beetle (*Dendroctonus engelmanni* Hopk.).** *Repr.* from *Proceedings of the Helminthological Society of Washington, Washington* 23 (1), 1956 (14–24). 2 refs. [Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo.]

Sphaerulia dendroctoni sp. nov., *Aphelenchus reversus*, and *Ektaphelenchus obtusus* sp. nov. were collected from the body cavity and *Rhabditis obtusa* from the gut. In studies in 1952–53, egg-laying was reduced by infestation from a mean of 76·5 to one of 28·8 eggs for beetle ♀s infested by *S. dendroctoni* and from 63 to 35 for those infested by *A. reversus*; the effect of *E. obtusus* is not known, and *R. obtusa* has little or no effect. *Diplogaster pinicola*, the only external parasite found, was collected from below the elytra and in folds of the abdomen of adults and larvae. The life history of the individual parasites is discussed. During 1952–53, parasitization by *S. dendroctoni* and *A. reversus* increased in the areas studied, in Colorado and N.W. Montana. Thirteen species of nematodes, including all the above except *S. dendroctoni*, were collected from egg and larval galleries of *D. engelmanni*.

4233. **Radioisotope studies.** *Rep. Stheast. For. Exp. Sta. 1955*, 1956 (78).

1327 *Dendroctonus frontalis* specimens were tagged by immersing them in Ir^{192} solution and then released on some trees in an isolated spot. A week later 9 newly infested trees were found round the release point, but only 3 radioactive beetles were detected on them. It is concluded that the presence of a large concentration of beetles must have attracted others from surrounding infected areas and that such concentrations lead to attacks on sound trees.

4234. MOGREN, E. W. **Silvical factors influencing resistance of Ponderosa Pine to Black Hills beetle [*Dendroctonus ponderosae*] attack.** *Proc. Soc. Amer. For. 1955*, 1956 (61–3).

Cf. *For. Abstr.* 17 (No. 1809).

4235. KARPIŃSKI, J. J. Bruzdkowiec polski (*Pityophthorus polonicus* Karp.) w górskich jedlinach. **[*P. polonicus* in mountain Silver Fir stands.]** *Roczn. Nauk leśn.* No. 11, 1955 (77–82). [Pol.russ.e.] (*Prace Inst. bad. Leśn.* No. 136.)

This species, described in *Annales Musei Zoologici Polonici* 14 (8), 1949, has a 2-year life period in the conditions of the National Reserve of Pieniny (Poland), occurring in mixed *Abies alba* stands on northern slopes. It is suggested that *P. polonicus* is a Pliocene relict.

4236. BOUČEK, Z. Parasiti kůrovce *Pityophthorus polonicus* Karp. z Pienin. **[Parasites of *P. polonicus* from the National Reserve of Pieniny.]** *Roczn. Nauk leśn.* No. 11, 1955 (83–92). [Cz.Pol.cz. pol.russ.e.] (*Prace Inst. bad. Leśn.* No. 137.)

The following species were identified among the hymenopterous parasites of *P. polonicus*: *Dendrosotinus similis* sp. nov., *Dinotiscus capitatus*, *Karpinskiella pityophthori* gen. et. sp. nov., a species of the tribe Pteromalinae, *Eupelmus urozonus* and *Tetrastichus* sp. The new genus and new species are described in English in the Czech text.

4237. NIKLAS, O. F. Untersuchungen über das Auftreten von Krankheiten und Schädigungen, insbesondere über die 'Lorscher Seuche' (*Rickettsia melolonthae* Krieg) in Freiland-Populationen des Maikäfer-Engerlings (*Melolontha* spec.) **[Research on diseases and injuries, especially the disease caused by *R. melolonthae*, among populations of larvae of *Melolontha* spp. in the field.]** *Z. PflKrankh.* 63 (2) 1956 (81–95). 18 refs. [G.g.] E.M.B.

Larvae collected in late July to mid-Nov. 1954 from trenches or after cultivation of forest, clear-felled and arable land in the Lorsch and Lampertheim forest districts, were transferred to the laboratory, and kept in sterile conditions to avoid secondary infections. Results showing the % still living or dead from different causes by 31 March 1955 are tabulated. *R. melolonthae* was responsible for 47·3% of the 465 deaths, other bacterial diseases for 16·2%, fungus diseases for 4%, nematodes for 3%, dropsical conditions for 1·1% and other identified causes (*Plistiphora melolonthae*, *Polymastix melolonthae* and Tachinidae) for 0·8%; the cause of 25·5% of the deaths could not be determined. Most of the diseases showed maxima in summer and at the end of the year. Larvae suffering from *R. melolonthae* are found on the soil surface in late autumn, and laboratory experiments showed that at low temperatures infected larvae become restless and make their way to the surface, while healthy larvae stay where they are or go deeper. Field observations failed to show whether birds and small mammals eat the infected larvae, and it is in any case uncertain whether the infection would spread by this method.

4238. BERWIG, W. Engerlingsbekämpfung durch maschinelle Bodenbearbeitung. **[Cockchafer control by mechanical working of the soil.]** *Forstwiss. Cbl.* 74 (5/6), 1955 (183–6). [G.]

Describes the complete clearance of vegetation after stump grubbing on a felled site due for reforestation. The thorough working of the soil greatly diminished the chemical treatments necessary for cockchafer control.

Hymenoptera

4239. MIDDLEKAUFF, W. W. **A new species of web-spinning sawfly feeding upon Pines (Hymenoptera, Pamphiliidae).** *Pan-Pacific Entomologist, San Francisco* 29 (3), 1953 (133–4). I.I.E.

A short preliminary description of the new species *Cephaleia marginata.*

4240. RUMPHORST, H. Weitere Beiträge zur Biologie der stahlblauen Kiefernschonungs-Gespinstblattwespe (*Acantholyda erythrocephala* L.). **[On the biology of *A. erythrocephala*.]** *Mitt. biol. ZentAnst., Berl.* No. 75, 1953 (143–6). [G.]

Reports observations on an infestation near Recklinghausen, Westphalia, which had spread from a tree of *Pinus strobus* and affected ca. 170 ha., chiefly thinned stands of 45 years or more. Distribution of pupae in the ground and eggs on the trees, periods of emergence, flight, hatching, and parasites are dealt with.

4241. WEISER, J., and KOEHLER, W. *Neoaplectana janickii* n. sp. nový cizopasník larev ploskohřbetky *Acantholyda nemoralis* Thoms. v Polsku. **[*N. janickii* sp. nov. a new parasite of *A. nemoralis* larvae in Poland.]** *Roczn. Nauk leśn.* No. 11, 1955 (93–110). 10 refs. [Cz.Pol.russ.e.] (*Prace Inst. bad. Leśn.* No. 138.)

A description of the new species (in English) is given in the Czech text. The nematode belongs to the family *Anguillulidae*, sub-family *Steinernematinae.*

4242. L[AING], E. V. **Ringing of Birch by sawfly (*Cimbex femorata*, L.)** *Scot. For.* 10 (2), 1956 (112).

Photograph and description of injury to Birch twigs by oviposition. When the eggs hatch, the larvae migrate to the leaves and feed there.

4243. OHNESORGE, B., and THALENHORST, W. Zur Kenntnis der Fichten-Blattwespen. IV. Dispersion. **[Spruce sawflies. IV. Distribution of individuals in the biotope.]** *Z. PflKrankh.* 63 (4), 1956 (197–211). 12 refs. [G.g.e.] [Niedersächsische Forstliche Versuchsanstalt, Göttingen.] E.M.B.

Studies the distribution of different species horizontally and vertically at the egg, larval and pupal stages, showing results in diagrams, graphs and tables. Generally, distribution is even throughout the crowns of a Spruce stand uniform in age and site, but certain factors affect the general pattern (e.g. the preference of all species for sunny, sheltered places; the relationship between distribution of *Pristiphora abietina* and *Pachynematus pallescens* and that of host trees having buds at the right stage for egg-laying; and specific characteristics, which may be ecologically or physiologically determined, of vertical distribution of some species). [Cf. *For. Abstr.* 17 (No. 655).]

4244. GREGOR, F., and MARTINEK, V. Pilatky *Apethymus braccatus* (Gmelin) a *A. abdominalis* (Lepeletier) jako škůdci dubu. **[The sawflies *A. braccatus* and *A. abdominalis* as pests of Oaks.]** *Zool. ent. Listy* (*n.s.*) 3 (3), 1954 (191–201 + plate). 21 refs. [Cz.russ.g.] I.I.E.

Gives descriptions and an account of the bionomics of the two species, as observed during outbreaks in 1953 on Oak [*Quercus robur* s.l.?] over ca. 1000 ha. of bottomland forests at Lanžhot and Tvrdonice, S. Moravia, in conjunction with outbreaks of *Tortrix viridana.* Aerial dusting with 5% Dynocid (DDT) at 50 kg./ha., undertaken against *T. viridana* at Tvrdonice, gave very good incidental control [no details quoted] of the two sawflies, both in the first to third instars.

4245. KOYAMA, R., and KUSHIDA, T. **Some field examination of natural enemies against *Diprion nipponica* and the analysis of their rôle in nature.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/24/11, 1956. pp. 2. [Government Forest Experiment Station, Tokyo.]

4246. WELLENSTEIN, G. Was können wir von der roten Waldameise im Forstschutz erwarten? **[The role of *Formica rufa* in forest protection.]** *Beiträge zur Entomologie, Berlin* 4 (2), 1954 (117–38). 58 refs. [G.g.] I.I.E.

An investigation into the effects of red-ant colonies on pest populations in Pine stands, by (*a*) prey counts, (*b*) counts of arthropod and worm populations on, and in, soil samples taken at various distances from nests, and (*c*) counts of insects and insect excrement on glue boards distributed round them (to assess the insect populations above ground). Some of these observations were made during a *Diprion pini* epidemic. 'Population gradients' towards the nests were more marked for small flies. At 18 m. distance, populations of caterpillars were about ⅓ and those of *Diprion* about ⅔ those at 40 m., where the influence of the ant nests ceased to be noticeable. It is concluded that populous nests can prevent defoliation within a radius of 15–25 m. Effective protection would require groups of nests.

4247. Radonjić, S. Primena motornog zaprašivača 'Toksaver' za suzbijanje obične borove zolje u Dubočici. **[Use of the 'Toksaver' motor duster in the control of *Diprion pini* at Dubočica.]** *Zašt. Bilja* No. 29, 1955 (93–7 + plate). [Croat.e.] I.M.I.

Describes this motor duster, which weighs 36–38 kg., can be carried by 2 men, and has vertical and horizontal throws of respectively 20 and 16 m., with notes on the organization of work in operations from 17 Aug. to 10 Sept. 1954. Ca. 700 ha. of Pine stands were treated, using 3950 kg. of Lindane (1% BHC), said to have given 100% success. The duster is very convenient for use in hilly waterless regions.

4248. Breny, R. Considérations sur les apparitions larvaires chez *Neodiprion sertifer* Geoffr. **[Larval emergence in *N. sertifer*.]** *Bull. Inst. agron. Gembloux* 24 (1), 1956 (12–21). 3 refs. [F.flem.e.g.] E.M.B.

A report on investigations into the relationship between daily larval emergence and air temperature and relative humidity (r.h.) concluding that: (1) under natural conditions hatching does not depend on r.h.; (2) heat is essential, but high diurnal temperature does not always imply a plentiful daily emergence; and (3) the temperature threshold for hatching is 50° C. [Cf. *For. Abstr.* 16 (No. 3228).] *From author's summary.*

4249. Holling, C. S. **The selection by certain small mammals of dead, parasitized, and healthy prepupae of the European Pine sawfly, *Neodiprion sertifer* (Geoff.).** *Canad. J. Zool.* 33 (6), 1955 (404–19 + 2 plates). 13 refs. O.R.S.

The mammals considered were *Sorex cinereus cinereus*, *Blarina brevicauda talpoides* and *Peromyscus maniculatus bairdii*. Preference was shown for sound cocoons over those attacked by fungi, and, by *S. cinereus*, over parasitized cocoons.

4250. Muldrew, J. A. **Some problems in the protection of Tamarack against the Larch sawfly, *Pristiphora erichsonii* (Htg.).** *For. Chron.* 32 (1), 1956 (20–30). 47 refs. (*Contr. Div. For. Biol. Dep. Agric. Can.* No. 250.)

Reviews the current theories and practices of chemical, biological, silvicultural, and natural control.

4251. Beckwith, L. C., and Drooz, A. T. **Tamarack mortality in Minnesota due to Larch sawfly outbreak.** *J. For.* 54 (4), 1956 (268–9).

Pristiphora erichsonii has been endemic in *Larix laricina* stands in Minnesota since 1948, but mortality due to defoliation was first observed in 1954, 7 years after the outbreak began. This agrees with similar observations made in Canada, where dead trees were found after 7 years of defoliation [cf. *For. Abstr.* 16 (No. 3229)].

4252. Turnock, W. J. **Injury to Tamarack shoots caused by the Larch sawfly.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (1), 1956 (3).

Data from some preliminary observations on injury to *Larix laricina* during an outbreak of *Pristiphora erichsonii* indicate that sawfly oviposition injury tends to diminish the vigour of those shoots that are not actually killed.

4253. Pluquet, H. Beitrag zur Kenntnis der Douglasienschlupfwespe (*Megastigmus spermotrophus* Wachtl). **[A note on *M. spermotrophus*.]** *Wald* 3 (8), 1953 (243–5). 13 refs. [G.]

Deals with the extent of seed infestation in various parts of E. Germany, the biology of the insect, and various seed treatments, of which only the drying of the cones at 60° C. is considered successful.

4254. Hussey, N. W. **A new species of *Megastigmus* (Hym: Chalcidoidea) from British Somaliland.** *Bull. ent. Res.* 47 (1), 1956 (57–9). 4 refs.

Owing to the infestation of the seed by an unidentified insect, difficulty is being experienced in Daloh Forest, Erigavo, in obtaining natural regeneration of *Juniperus procera*. *Megastigmus somaliensis* sp. nov. bred from the infested seed, is described.

4255. Joly, R. Invasion nocive d'un hyménoptère Cynipidae, *Andricus testaceipes* Htg. **[Harmful infestation by *A. testaceipes*.]** *Rev. for. franç.* 8 (4), 1956 (245–6 + 3 photos). [F.]

This, alone of the gall insects infesting Oaks, may cause serious damage to seedlings. The insect has two generations, one producing galls in leaves, the other in the bark of small twigs and seedlings. The only method of control in the nursery is to pull up and destroy affected plants, or remove affected branches.

4256. Lucca, F. de. O combate às formigas cortedeiras no município de São Paulo. **[Control of leaf-cutter ants in the city of São Paulo.]** *Biológico* 22 (2), 1956 (28–32). [Port.] C.G.B.

Notes on *Atta* spp., and the government's campaign for their control since 1904. In spite of the measures taken, the pest is by no means under control.

459. Other Animals

4257. Goodey, T. [Revised by Goodey, J. B., and Franklin, M. T.] **The nematode parasites of plants catalogued under their hosts: revised, rearranged and brought up to date.** Commonwealth Agricultural Bureaux, Farnham Royal, Bucks. 2nd ed. (rev.) 1956. pp. 140. 28 pages of refs. Price 27*s.* 6*d.*

46. Damage to Tree Growth by Man

See also No. 4049.

4258. Henry, P. W. T. **Damage to saplings and poles of economic species during operations under the tropical shelterwood system.** *Inform. Bull. For. Dep. Nigeria* No. 22, 1955. pp. 12.

Tabulates data on the number of (1) saplings of valuable species cut back in error during climber cuttings and cleanings, and (2) poles poisoned in error, for two separate areas in Benin division.

Loss of (1) was mainly in height classes 1 ft. 6 in.–5 ft., and of (2) in girth classes 1–2 ft. g.b.h.

48. Injuries Due to Unknown or Complex Causes

See also No. 3657.

4259. GROENEWOUD, H. VAN. **A root disease complex in Saskatchewan White Spruce.** *For. Chron.* 32 (1), 1956 (11–3). 4 refs. (*Contr. Div. For. Biol. Dep. Agric. Can.* No. 255.)

A preliminary report on co-operative studies of this condition, in which trees die singly or, more often, in groups. Death occurs usually at 40–80 years, the roots and butts being often attacked by *Polyporus circinatus*, which is believed to hasten the death of the tree and to gain entrance through wounds caused by *Hypomolyx* sp. [cf. *For. Abstr.* 13 (No. 3976)]. The soils in the affected areas can be classified in two distinct groups, both of which result in shallow rooting of White Spruce, characterized respectively by the presence of an impermeable layer near the surface and by a subsoil with m.c. below wilting point for most of the growing season. Determination of pore space [cf. *For. Abstr.* 14 (No. 2343)] showed that low porosity alone is not enough to retard root growth. Daily measurements in both humus and soil at 13 localities showed that in an average growing season the m.c. of all soils except sandy ones was above permanent wilting point. Soil pH appears to be an important factor. Wherever the pH of the top soil was ⩾ 7, the disease was not serious even in the most unthrifty stands. Soils in affected areas contained very small amounts of water-soluble salts compared with those in healthy stands. It appears that plant communities afford the most practical indication of soils favourable to this condition; in particular, the White Spruce/*Hylocomium*/*Calliergonella* faciation of the White Spruce/Poplar/shrub/herb association is a sign of dangerous conditions. It is easily recognizable, covers large areas of shallow soils, and forms dense stands of White Spruce. About 75% of all examples of group dying occurred in this community.

4260. WHITE, P. R., and MILLINGTON, W. F. **The distribution and possible importance of a woody tumor on trees of White Spruce, *Picea glauca*.** *Cancer Research, Chicago* 14 (2), 1954 (128–34 + 4 photos). 21 refs. [Roscoe B. Jackson Memorial Laboratory, Bar Harbor, Maine.] O.R.S.

[Cf. *For. Abstr.* 16 (No. 734); 17 (No. 3657).] A tumour affecting boles, branches and roots of *P. glauca*, and ranging in size from small ridges 1 × 3–4 mm. to burls 1 m. or more in diameter, was studied. A survey of distribution showed it to be restricted, with a few possible and unverified examples, to trees growing within a few feet of the ocean, on exposed shores and headlands from Maine to Nova Scotia. The tumours are initiated in the first year's growth of any affected branch. A hypothesis has been formulated, suggesting three consecutive causal factors: an insect (*Chermes abietis*) lesion, a sensitizing agent such as the crown gall bacterium *Agrobacterium tumefaciens*, and an evoking agent such as salt spray. This hypothesis is consonant with the observed facts, except the reported occasional occurrence of such tumours in two widely separated localities in the interior of Canada, viz. the Rockies and the Upper Lake Superior region. It is suggested that these exceptions may represent a tumour similar in appearance but of different origin from the one investigated.

5. FOREST MENSURATION. INCREMENT; DEVELOPMENT AND STRUCTURE OF STANDS. SURVEYING AND MAPPING

4261. RUTKOWSKI, B. Użyteczność nomogramów w pracach urządzania lasu. **[Usefulness of nomograms in the [mensurational] work of forest management.]** *Sylwan* 100*B* (2), 1956 (68–80). 5 refs. [Pol.]

Discusses, with illustrations, the principles of deriving nomograms of different construction for forest management purposes, and the merits of the 2 main types of nomogram (the Z-shaped and the logarithmic).

52. Measurements of Stem Dimensions and Volume of Trees, Stands, Forests and Timber

4262. YOSHIDA, M., and HIRATA, T. **[Some studies on the stand composition of artificially planted forests (VI).]** *Bull. Tokyo Univ. For.* No. 48, 1955 (43–64). [Jap.jap.]

A detailed analysis, with numerous tables, of diameter, height, and volume distribution etc. in 12 small plots of *Cryptomeria japonica*, 19–46 years old, of 3 site classes, thinned once or twice in the past. [Cf. *For. Abstr.* 16 (No. 3246).]

4263. GROOME, J. S. **Muninga (*Pterocarpus angolensis* D.C.) in the western province of Tanganyika. II.—Growth and form statistics.** *E. Afric. agric. J.* 21 (3), 1956 (189–200).

[Cf. *For. Abstr.* 17 (Nos. 1307, 4342).] Data are derived from surveys on 330,000 acres. They include number of trees/acre and volume per unit area by girth classes, girth-increment figures, ring-count figures, relationship of height to age in dominant trees, height in relation to girth class, volume per tree in relation to age, bark allowance, and crown/girth relationship.

521. Diameter (Girth) and Sectional Area

See also Nos. 4272, 4285.

4264. HOLLAND, D. A. **Soil acidity in relation to trunk girth of Apples.** *Rep. E. Malling Res. Sta. 1954/55*, 1956 (80–5). 10 refs.

The limitations of detecting a relationship between soil pH and trunk girth of Apple trees, imposed by the sampling error of soil pH, are considered. Assessments of the sampling error under different conditions are made and a preliminary test of the likelihood of detecting a correlation between soil pH and trunk girth is suggested. Three possible relationships between soil pH and trunk girth are studied.

4265. PEARCE, S. C. **Studies in the measurement of Apple trees. III. The use of branch girths as a substitute for the trunk girth**. *Rep. E. Malling Res. Sta. 1954/55*, 1956 (76–9). 4 refs.

A search is described for some quantity based on branch girths for use instead of trunk girth when the latter cannot be measured (e.g. because of lowness of crotch). It is shown that if branch girths > 5 cm. are added together and divided by the square root of their number, a satisfactory substitute is obtained. [Cf. *For. Abstr.* 16 (Nos. 415, 757).] *From author's summary.*

4266. GROCHOWSKI, J. Wpływ kierunku pomiaru pierśnic na wynik oznaczania przyrostu drzewostanu. **[Effect of the direction from which calipering is done on the determination of stand increment.]** *Roczn. Nauk leśn.* No. 13, 1955 (3–28). 4 refs. [Pol.russ.g.] (*Prace Inst. bad. Leśn.* No. 144.)

Theoretical considerations and empirical observation disprove the generally acepted belief, that the error in the determination of d.b.h. increment due to irregularities in stem cross-section can be disregarded provided that d.b.h. is calipered at the same height and from the same direction at the beginning and end of the increment period. The absolute value of the % error can be somewhat higher at the end than at the beginning, owing to the variation of shape in the mean cross-section. The absolute value of the % error of the increment (b.a. or d.b.h.) is greater than that of the b.a. or d.b.h.; pertinent figures are given for a Pine stand over a period of 10 years (70–80 years of age). In order to minimize the error in increment determination, the author recommends either (1) measurement of d.b.h. at a constant angle to the prevalent long-axis direction in the stand, or (2) division of the stand into 2 groups of strips and measurement of d.b.h. in one group at right angles to the direction of d.b.h. measurement in the other.

4267. JOHNSON, F. A. **Use of a bark-thickness/tree-diameter relationship for estimating past diameters of Ponderosa Pine trees.** *Res. Note Pacif. Nthwest. For. Range Exp. Sta.* No. 126, 1956. pp. 3. 5 refs.

Presents a graph showing relationship of double bark thickness to d.o.b. at breast height, and formulae $D_p = D_n - W_g\,(1{\cdot}121)$ for trees $\geqslant$ 10 in. d.b.h. and $D_p = D_n - W_g(1{\cdot}245)$ for trees $<$ 10 in. d.b.h., where D_p = past diameter over bark at 4·5 ft., D_n = present diameter and W_g = diameter growth of the wood for a specified number of years (measured on an increment core), and the factors 1·121 and 1·245 represent allowances for bark growth. [Cf. *For. Abstr.* 16 (No. 4367).]

4268. JEFFERS, J. N. R. **Barr and Stroud dendrometer, type F.P.7.** *Rep. For. Res. For. Comm., Lond. 1954/55*, 1956 (127–36 + 2 photos).

Describes a dendrometer based on a range-finder principle, which has been designed to measure from the ground diameters at various points up a tree, together with the height of these points above the base. Tests of the accuracy of the instrument are reported and its use in the field to calculate tree volumes is described. The present price of the dendrometer is £350–400.

4269. MÜLLER, G. Das Baumzählrohr. **[The tree-count telescope.]** *Allg. Forstztg.* 64 (19/20), 1953 (249–51). [G.]

Describes an instrument based on prismatic diffraction, said to avoid some of the sources of error (e.g. unsteadiness of the observer's hand), of the Relascope.

4270. PRODAN, M. Genauigkeit der Winkelzählprobe nach Bitterlich. **[The accuracy of Bitterlich's sampling method.]** *Allg. Forstztg.* 64 (7/8), 1953 (96–100). 11 refs. [G.g.]

Deals with the mathematical-statistical basis of the method and shows that lack of homogeneity in a stand can cause errors of 1–8%, which may combine with the other sources of error discussed in the literature to cause even larger deviations, but that repeated sampling can reduce the error to 2–5%. The computation of volume by the use of Krenn's 'tariffs' and its distribution over diameter classes are also discussed.

522. Height, Length

See also Nos. 4272, 4337–9.

4271. MATUSZ, S. Dendrometr taksacyjny. **[A dendrometer [hypsometer].]** *Sylwan* 99 (5), 1955 (456–61). [Pol.]

Illustrated description of the design and use of a transparent celluloid plate, 24 cm. high and 12 cm. wide, set in a frame, and having a reticule of 8 squares and both vertical and horizontal protractor scales. The instrument, which is held between thumb and finger, can be used for measuring tree or any intermediate height, crown breadth, lean of stem, and the slope of the ground. The author (and designer) claims that tree height can be determined to an accuracy of 5%.

523. Bark

See Nos. 4267, 4312.

524. Determination of the Volume of Trees and Stands

524.1 Principles of Volume Determination. Form (Taper)

See also Nos. 4281, 4283–4.

4272. WANNER, J. Formzahl und Baumhöhenmessungen. **[The form factor and the measurement of tree heights.]** *Allg. Forstztg.* 64 (9/10), 1953 (124–6). [G.]

The author's form-factor formula is

$$f = \frac{1}{6} + \frac{2}{3}x^2 - \frac{1{\cdot}3}{H} \cdot \frac{2}{3}x^2 + \frac{5}{6} \cdot \frac{1{\cdot}3}{H},$$

where H is tree height, and x (the ratio of diameter at ½ height above b.h. to d.b.h.) can be got from theodolite readings (method described) as the ratio of the angular measurements of the two diameters. He recommends the construction of local volume tariffs as b.a./volume curves plotted on special graph-paper with volume read on a plain ordinate scale, and special abscissa divisions reading in 1-cm. diameter gradations but increasing as the b.a. values corresponding to those diameters, so that the b.a./volume line is almost straight.

A simplified method is given of measuring tree heights on slopes with the Blume-Leiss hypsometer, and to overcome the difficulty of reading at low light intensities, it is suggested that the staff used should be hollow, with dry batteries and bulbs to illuminate the marks when necessary.

Finally, a method is suggested which makes it possible, with little extra trouble, to find the b.a. mean tree and the number of trees per ha. when sampling by Bitterlich's *Winkelzahl* method.

4273. HORN, A. F. **A simplified method of estimating form class of Loblolly and Shortleaf Pine stands in Mississippi.** *J. For.* 54 (3), 1956 (185–7). 1 ref.

A method (probably of wider application), is detailed, whereby the average stand form class, e.g. of *P. taeda* and *P. echinata* sawtimber, of average or better density, can be derived (in this case) from the ratio of d.u.b. at 7 ft. and the d.o.b. at 2·25 ft. from the ground, measured on groups of 20 or more trees. The mean variation of 13 stands so measured was ± 2 Girard form-class numbers [cf. *For. Abstr.* 17 (No. 688)]. The method relies on the fact that lines passing through the ends of parallel diameters, u.b. at the top of the first 16 ft. log and o.b. at breast height, are approximately tangential to the o.b. surface of the log in the region of breast height. The author shows how to select the best 2 heights near breast height to give the most accurate ratio.

4274. ARMĂŞESCU, S., and DECEI, I. Contribuţii la cunoaşterea indicilor de formă ai arborilor din R.P.R. Studiul indicilor q_2 la mesteacăn. **[A contribution to the study of form quotients of Rumanian trees: the form quotient q_2 of Birch.]** *Bul. şti. Acad. Repub. rom.* (*Sect. Biol.*) 7 (4), 1955 (999–1010). 7 refs. [Rum.russ.f.] O.R.S.

In this study the authors compare the results obtained in calculating the form factor of Birch by Schiffel's formula using (1) the classic formula, (2) a single mean form quotient (q_2), (3) variable form quotients based on height and d.b.h. Tables for variable q_2 values are given. The use of variable q_2 is particularly advisable in the case of Birch. In comparing values of q_2 for Birch determined in the U.S.S.R. with that established in Rumania, it was found that the Rumanian form quotients varied between 0·4 and 0·8 with a mean value of 0·611, compared with a mean value of 0·664 for the U.S.S.R., from which it follows that the stems have in general a more conical form in Rumania.

524.3. Volume of Tree Groups and Stands

See also Nos. 3778, 4272.

4275. ARBONNIER, P. Le calcul du volume bois fort tige d'un peuplement sur pied. **[The calculation of the volume of stem sawlogs in a stand.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/23/2, 1956. pp. 13 + 2 gphs. 3 refs. [F.e.g.] [Station de Recherches Forestières, Nancy.]

Describes the sampling rules and construction of tariff tables for estimating volume, using the stem classification explained by P. Ayral at a previous congress [see *For. Abstr.* 15 (No. 3922)]. The number of sample trees, in the stratified sampling, will generally be > 30. Tariff tables are based on the formula $V = a + bC^2$, where a and b are constants and C = true g.b.h. Where one species only is involved, the method usually gives a standard error $< 2\%$; with more than one species, it is recommended that the values of C for the sample trees of each species should be plotted separately, in order to see whether the regression lines are specific to the species or not. If the lines are similar, it is unnecessary to calculate a tariff table for each species; if they are different, tables must be made for each species.

4276. HUMMEL, F. C. **Tariff tables for conifers in Great Britain.** *For. Rec. For. Comm., Lond.* No. 31, 1956. pp. 16. Price 1*s*.

The tables (with explanation) are reproduced from *Bull. For. Comm., Lond.* No. 24 'The basal-area line' [see *For. Abstr.* 16 (No. 4377)].

4277. JOHNSON, F. A. **Volume tables for Pacific Northwest trees (a compilation).** *Agric. Handb. U.S. Dep. Agric.* No. 92, 1955. pp. 112.

Gives tables (cu. ft. and bd. ft.) for *Pinus ponderosa, Pseudotsuga taxifolia. Tsuga heterophylla, Picea sitchensis, Abies amabilis, Pinus contorta, Alnus rubra, Larix occidentalis, Abies concolor, A. grandis, Chamaecyparis lawsoniana, Pinus monticola, P. lambertiana, Thuja plicata, Libocedrus decurrens, Abies procera, Picea engelmannii* and *Populus trichocarpa*.

4278. SETH, S. K., and LOHANI, D. N. **Volume tables and diameter growth curve for *Abies pindrow* Spach.** *Bull. U.P. For. Dep.* No. 22, 1954. pp. 14.

Volume and diameter-increment tables are based on data derived from measurement of 248 trees and ring counts of 150 stumps respectively.

4279. SETH, S. K., and LOHANI, D. N. **Volume tables and diameter growth curve for *Picea smithiana* (Wall.) Boiss. [*P. morinda*.]** *Bull. U.P. For. Dep.* No. 23, 1954. pp. 14.

Volume and diameter-increment tables are based on data derived from measurement of 211 trees, and ring counts of 160 stumps respectively.

4280. FRAUENDORFER, R. Ein Massentarif für die Gebirgsfichte im gleichaltrigen Hochwald. **[A volume 'tariff' for even-aged Spruce stands at high altitudes [in Austria].]** *Zbl. ges. Forstw.* 73 (1/2), 1954 (76–103). 23 refs. [G.g.]

Based on stem analyses of 293 mean trees. The method of compilation is given, along with results of checks on actual stand data and notes on the construction of a nomogram-cum-slide-rule (illustrated) for the calculation of volume. An extract from the tariff and some auxiliary tables are also given.

4281. RADWAŃSKI, B. Tablice miąższości i zbieżystości dłużyc, kłód i wyrzynków strzały dla sosny. **[Volume and taper tables for whole stems and logs of *Pinus sylvestris*.]** *Roczn. Nauk leśn.* No. 10, 1955 (3–353). 4 refs. [Pol.russ.e.] (*Prace Inst. bad. Lesn.* No. 134.) Price *Zł.*74·80.

The tables, intended to be used for determining the u.b. volume of round timber in standing Pine, comprise: (1) tables of volume u.b. and taper of whole stems, showing cumulative volume by 1-m. steps proceeding up the stem, (2) summary tables of total stem volume u.b.; (3) ditto o.b.; all by 1-m. height classes, and 3 tables for stems of small d.b.h. and height. These tables are based on Polish experimental data obtained from sections of 3310 trees felled between 1930 and 1951.

4282. CROMER, D. A. N., MCINTYRE, G. A., and LEWIS, N. **General volume table for *Pinus radiata* giving underbark volumes in cubic feet to 4 inches d.u.b.** *Bull. For. Timb. Bur. Aust.* No. 33, 1955. pp. 59.

Based on measurements of 1400 selected sample trees from permanent sample plots in S. Australia.

4283. LEWIS, E. R. **A form class volume table for exotic coniferous species in New Zealand.** *Tech. Pap. For. Res. Inst. N.Z. For. Serv.* No. 7, 1955. pp. 16. 1 ref.

This report describes the preparation of a form-class volume table for all exotic species and localities in New Zealand. Total stem and merchantable volume are related, in a basic volume table and two alignment charts, to d.b.h., total height, half-height form quotient, and breast-height diameter ratio. Form quotient is defined as the proportion of the diameter at half total height to d.b.h., both outside bark; breast-height diameter ratio is defined as the proportion of diameter u.b. to diameter o.b. at breast height. The table proved generally accurate for all species and localities: the greatest error was about 4% for total stem volume and about 5%, for practical purposes, for merchantable volume. The preparation of the table, the accuracy tests, and method of application are described. *Author's summary.*

4284. BURSTALL, S. W. **Combined taper and volume tables for *Pinus ponderosa*—Southland, 1954, unthinned stands: *Pinus nigra* var. *calabrica*—Southland 1954, thinned stands.** *N.Z. For. Res. Note* No. 3, 1955. pp. 32.

4285. SMITH, J. H. G., and KER, J. W. **Yield table conversion factors make 'quick cruising' quicker.** *B.C. Lumberm.* 40 (4), 1956 (31 . . . 34). 9 refs. [Faculty of Forestry, University of British Columbia.]

Gives a table of volume/b.a. ratios based on yield tables for Douglas Fir and Western Hemlock, and the steps in field work and calculation for deriving volume/acre from the basal area/acre obtained by prism or relascope.

524.6. General Surveys of Forests and Whole Tracts of Forest. Partial Enumeration Surveys, Timber Cruising

See also Nos. 4270, 4285, 4653.

4286. Waldstandsaufnahme in der Durchführung. **[Forest survey in progress.]** *Allg. Forstztg.* 64 (9/10), 1953 (109–26). [G.]

Includes articles on: The [Austrian] forest survey in progress (*A. Horky*), Forest and stand inventories (*M. Prodan*), and Inventory of growing stock (*S. Güde*), all dealing largely with the advantages and limitations of mathematical-statistical methods (e.g. Loetsch, Bitterlich) for mountain forests; Site mapping in Württemberg (*H. Jelem*), and Forest surveys in Jugoslavia (*R. Pipan*), describing the surveys of 1946–47 and 1951, the first of which included data on regional wood requirements, disclosing an unexpectedly high demand for fuel.

4287. MOKASHI, V. K. **Study of sampling techniques in enumerations in forests.** *Indian For.* 82 (4), 1956 (171–5 + 1 gph.). 5 refs.

Investigations on the proper sampling technique and the sampling intensity for estimation of growing stock with a reasonable accuracy are in progress in Bombay State. Certain results arising out of these investigations on complete enumeration data for one compartment of Dangs division, are discussed. It was found that, with strip sampling over larger areas comprising a large number of compartments, the number of Teak trees per acre might be estimated with 4% standard error by adopting 8% sampling intensity, while by two-stage random sampling, where a certain number of strips are randomly selected in the first stage after dividing the forest area into strata, and a certain number of plots are randomly selected from the selected strips at the second stage, the same precision could be obtained by 5% sampling. In other words, it was seen that random line-plot survey gave more precise estimates than strip survey for the same intensity of sampling. Unfortunately there are no data available to judge the relative efficiencies of the two methods from the point of view of cost. *From author's summary.*

4288. MEYER, H. M. **The calculation of the sampling error of a cruise from the mean square successive difference.** *J. For.* 54 (5), 1956 (341). 1 ref.

The sampling error of a systematic cruise is usually smaller than indicated by the calculated standard error (s.e.). The bias in the calculated s.e. of a cruise due to stratification can be greatly reduced by calculating one-half of the mean square successive difference ($\frac{1}{2}\delta^2$) of the average volume per strip or line.

4289. SAVAGE, M. B. **What about size of the sample plot?** *For. Chron.* 32 (1), 1956 (75–6).

In a stand of average crop variability in Washington, 100 plots of different shapes and sizes were taken—circular, triangular, and rectangular, and $\frac{1}{100}$, $\frac{1}{50}$, $\frac{1}{20}$, $\frac{1}{10}$, $\frac{1}{5}$, $\frac{1}{3}$, $\frac{1}{2}$ and 1 acre. Plot volumes were recorded for all sizes and shapes, and the data analysed statistically. The $\frac{1}{2}$-acre rectangular plot (1 × 5 chains) was found to be the most efficient for old-growth timber, and the $\frac{1}{10}$-acre rectangular plot for small non-merchantable stands in the 6- to 12-in. diam. class, these being very homogeneous in structure. The $\frac{1}{5}$-acre circular plot, though not displaying a significant increase in coefficient of variation over the $\frac{1}{5}$-acre rectangular plot, was found to be more time-consuming and susceptible to plot-limit error.

525. Volume by Assortments. Merchantable Volume

See Nos. 4089, 4091.

527. Solid Volume of Stacked Products

4290. OSMASTON, H. A. **The relationship of solid to stacked volume for *Eucalyptus saligna* fuel, Arua Plantation, West Nile District.** *Tech. Note For. Dep. Uganda* No. 1/56, 1956. pp. 2.

Ten woodcutters' cubic-yard stacks, randomly chosen as reasonably near 3 × 3 × 3 ft., were measured for the mid-girth of each log, recorded by 2-in. girth classes. The sum of cross-section areas so obtained, divided by the cross-section area of the stack (9 sq. ft.), was assumed to give the solid fraction. The mean obtained was 75% (range 64–92).

4291. YOUNG, H. E. **Photogrammetric volume determination of huge pulpwood piles.** *Photogramm. Engng.* 20 (5), 1954 (808–13). 9 refs. L.S.

Five roughly pyramidal piles of pulpwood ranging from 587 to 4461 cords were measured by photogrammetric methods on aerial photos of 3 different scales, and also by the conventional ground transit method. Variation between photo scales and between the photogrammetric method and the ground transit method decrease with increase in volume of the pulpwood pile. The advisability of the photogrammetric method depends largely on local conditions. As regards cost, the photogrammetric method is practical with flying distances < 100 miles and when there are 4 or more piles to be measured at one time. Some of the advantages of the photogrammetric method such as elimination of hazard when walking on the pile, speed, and a possible increase in accuracy, may be offset by inclement weather and the risks of flying at low altitudes. *From author's summary.*

4292. BELCHER, R. G., and MARTIN, W. H. **The measurement of wood in conveyors.** *Pulp Paper Mag. Can.* 57 (3), 1956 (360 . . 378). (*Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 1545 (*B*–6).)

Visual, mechanical and photo-electric counting having proved unreliable, the Canadian International Paper Co. had recourse to photography. The apparatus consists of a Robot Royal III 35-mm. camera with range-finder and full flash synchronization. A spring motor, acting only when the conveyor is running, operates the shutter and moves on the film, at more or less 9-min. intervals, according as conveyor speed varies with the load. The lens covers an area 13 ft. square at a distance of 16 ft., giving a 12-ft. sample of conveyor length. An argon lamp, 4 reflector lights and 6 photo flood lamps provide the lighting, and a hot-air fan disperses morning fog. To eliminate exposure adjustments, the whole is enclosed in canvas. Kodak Tri-X was the film finally adopted. The apparatus cost \$500, and film and chemicals \$0·52/shift. One man operated the sampling, including development and counting. The counts included all bolts wholly in the picture and those partly in at one end. Total numbers of pieces per shift $S = PRA/L$, where P is the pitch [circle] of the main conveyor sprocket (ft.); R, the number of its revolutions (determined by solenoid counter); A, the mean number of pieces per exposure; L, the length (ft.) of conveyor appearing in the photo frame; and P and L (adjusted for parallax) are constants. The fiducial limits at the 1% confidence level in the tabulated results of one sampling are, for the single day and night shifts, a week's run, and a month's run, respectively ± 12–16%, ± 4·4%, and ± 2·2% from the mean, the last being well within the desired 2·5%. For volume estimations information on mean bolt volumes is also required.

53. Special Measurements of Trees and Stands (Crown Dimensions, Stand Density etc.)

See also Nos. 3635, 4271, 4329.

4293. MARUYAMA, I., and SATO, T. **Estimation of the amount of foliage of trees and stands.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/11/12, 1956. pp. 1. [Government Forest Experiment Station, Tokyo.]

In a study of *Pinus densiflora* 5–40 years old, the following formula was evolved to give fresh weight in kg. (W) of a tree of d.b.h. in cm. (d): $\log W = \log d - 0{\cdot}89$. Air-dry weight and oven-dry weight were 45% and 42% respectively of W.

4294. STOFFELS, A. Die Genauigkeit der Bestimmung der Stammzahl pro Hektar durch Messung von Stammabständen. **[Accuracy of determining number of stems per ha. by measurement of distance between stems.]** *Forstwiss. Cbl.* 74 (7/8), 1955 (211–8). 6 refs. [G.g.]

Discusses and compares the methods of Bauersachs [see *For. Abstr.* 4 (195)] and Köhler [see *For. Abstr.* 14 (No. 1401)], and concludes that Köhler's is more accurate, though Bauersachs' is quicker.

54. Assessment of Site Quality

See also Nos. 4329, 4653.

4295. HUSCH, B. **Use of age at d.b.h. as a variable in the site index concept.** *For. Mimeo N.H. agric. Exp. Sta.* No. 2, 1955. pp. 1. (Also in *J. For.* 54 (5), 1956 (340).)

Summarizes the advantages of using age at breast height for this purpose: e.g. when b.h. is reached most species have passed through the period of initial establishment; most species do not exhibit their characteristic growth abilities before reaching b.h.; it eliminates the use of a correction factor. [Cf. *For. Abstr.* 15 (No. 3886).]

4296. CLASON, M. S. Bonitering av skog—noen erfaringer. **[Determining site quality class.]** *Norsk Skogbr.* 2 (7), 1956 (211 . . . 216). 7 refs. [Nor.]

Discusses the two systems of site-class determination used in Norway based (1) on mean height of the stand at 50 years, and (2) on height in relation to number of annual rings at breast height of individual trees, preferably free-standing dominants. Concludes from investigations at Mathiesen-Eidsvold Værk in 1954 that (1) should be used for young well-managed stands and (2) for older stands that still show the effect of selection felling.

4297. PARDÉ, J. L'utilisation des hauteurs moyennes dans les études de production forestière et leur normalisation. [**The use of mean height in yield studies and proposals for its standardization.**] [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/25/9, 1956. pp. 7. 7 refs. [F.e.g.]

Application of the 't' test to data from French experimental plots has shown that thinning has no influence on mean height of even-aged forest stands. The usefulness of mean height in yield studies and the construction of yield tables makes it desirable to set up an international standard for (*a*) the age at which tree height defines quality class, and (*b*) grading of quality classes according to mean height.

4298. SPURR, S. H. **Soils in relation to site-index curves.** *Proc. Soc. Amer. For. 1955*, 1956 (80–5). 25 refs.

Discusses the errors likely to arise in site-index relationships derived from temporary sample plots and conventional techniques, and demonstrates the superiority of height-growth curves developed from measured growth on permanent sample plots, or data derived from stem analysis and internode measurements. Height-growth data for *Pinus resinosa* are used to illustrate this principle.

4299. SMITHERS, L. A. **Assessment of site productivity in dense Lodgepole Pine stands.** *Tech. Note For. Br. Can.* No. 30, 1956. pp. 20. 11 refs.

Because of difficulties encountered in trying to estimate forest site productivity in dense even-aged stands of Lodgepole Pine in the sub-alpine region of Alberta, a study was undertaken to investigate the value of various site indices now in use. For simplicity, the observations were confined to a single, pure, even-aged stand of 90-year-old Lodgepole Pine, on an area where climatic variation was at a minimum. Within this area, physiographic site was the major feature in determining productivity. Types of physiographic sites were sampled by means of one-tenth-acre plots to assess the variation in growing conditions which occurred in the forest. In addition to classifying physiographic sites, observations were made of the basal area, volume and number of stems per acre, as well as the dominant height and average of dominant trees on each sample plot. The relationships between these variables were analysed by graphic techniques. The results showed that site indices currently employed, including total volume, average height, dominant height and adjusted dominant height, cannot provide a valid estimate of site productivity because of the undue influence of number of stems per acre, which exhibits large chance variability. A productivity grouping based on a classification of physiographic characteristics was associated with relatively constant levels of basal area regardless of the number of trees present in dense stands. Because of its wide applicability and its freedom from extraneous influence, a productivity rating derived from the physiographic characteristics of the site appears to be the best type for use in dense Lodgepole Pine stands. [Cf. *For. Abstr.* 14 (No. 1419).] *Author's summary.*

4300. HODGKINS, E. J. **Testing soil-site index tables in southwestern Alabama.** *J. For.* 54 (4), 1956 (261–6). 13 refs. [Alabama Polytechnic Institute, Auburn.]

Discusses the regression studies made on Southern Pine throughout the south-east [see *For. Abstr.* 13 (Nos. 1432, 4093–4); 14 (Nos. 3606–7); 15 (No. 3890); 16 (No. 758)] in which environmental factors, notably soil properties, are related to site index, and tests them against the site indices established from height-growth in 24 stands in the upper and lower coastal plain of S.W. Alabama. In each of these stands the selected factors, the (height-growth) site index, and the range of soil-site indices are shown, and the two sets of indices are graphically compared for Longleaf, Slash and Loblolly Pines. It is concluded that these studies have yielded basic information of far greater value than the tables they have produced, the limitations of which are emphasized. They are no substitute for site indices based on height growth, which are particularly preferable when based on local and not on general height/age curves.

4301. SCHLOTS, F. E., LLOYD, W. J., and DEARDORFF, C. E. **Some soil characteristics which affect root penetration and timber site quality of Douglas Fir in Western Washington.** *Proc. Soil Sci. Soc. Amer.* 20 (1), 1956 (101–5). 6 refs. O.R.E.

Describes 5 characteristic soils, out of many examined, on which site indexes for 30- to 60-year second-growth stands have been ascertained. Profile rather than parent material appeared to be important. Highest site indexes were found on deep, friable soils; values decreased with increased profile development, particularly on clay or hardpan formations. Root penetration varied between 72 and 30 in. *From authors' summary.*

4302. LLOYD, W. J., SCHLOTS, F. E., and DEARDORFF, C. E. **Forest management practices as related to and influenced by forest soil differences in Western Washington.** *Proc. Soil Sci. Soc. Amer.* 20 (1), 1956 (105–7). 3 refs. O.R.E.

The authors discuss modifications in management practices as necessitated by the characteristics of the sites described in the preceding abstract, e.g. short rotations, caution in creating gaps on shallow soils where windthrow is a danger, artificial regeneration where hardwoods tend to encroach, and stress the importance of micro-site factors.

4303. LEAF, A. L., and KELLER, T. **Tentative technique for determining the influence of soil on the growth of forest plantations.** *Proc. Soil Sci. Soc. Amer.* 20 (1), 1956 (110–2). 13 refs. O.R.E.

Describes in some detail the analytical techniques applied in the course of a survey of conifer plantations in Wisconsin. A fairly close correlation between rate of growth of Red Pine and the fine-particle and organic-matter content of soils emerges. The same relations for White Spruce, though generally valid, were often obscured by the influence of the light conditions and root competition created by the Aspen used as nurses. *From authors' summary.*

4304. **Site index of Scarlet and Black Oak in relation to soils and topography**. *Rep. Stheast. For. Exp. Sta. 1955*, 1956 (17).

A regression equation is given showing the site index as a function of the depth of the A horizon, the % of sand in it, and position on slope.

4305. ERASLAN, I. Demirköy ilçesi meçe ormanlarında bonitet araştırmaları. **[Site class determination for [coppice] Oak in Thrace.]** *Istanbul Üniv. Orm. Fak. Derg.* 4*A* (1/2), 1954 (74–84). 12 refs. [Turk.g.]

Gives a table (the first instance of such from Turkey) showing for each site index over the range 13 + 1 . . . 30 (mean height of dominants in metres at 100 years) the same mean heights at 5-year intervals from 5 to 100 years. The data were collected in 61 representative plots of even-aged pure coppice Oak [*Q. pubescens*?] measured for a wide variety of sites and elevations in the Demirköy district on the Black Sea slopes of the Istranger Mountains. Curve and table construction followed Bruce and Schumacher.

4306. DĄBROWSKI, T., and SIKORA, B. Próba określenia wydajności siedlisk topolowych w oparciu o bonitowanie istniejących drzewostanów topolowych. **[Tentative determination of the productivity of Poplar sites, based on the site-class grading of existing Poplar stands.]** *Roczn. Nauk. leśn.* No. 13, 1955 (29–44). 3 refs. [Pol.pol.russ.e.] (*Prace Inst. bad. Leśn.* No. 145.)

Since data are so far lacking for accurately determining the total yields of Poplar stands in Poland, an attempt was made to determine site classes on the basis of volume. This was arrived at by both direct stand measurement and volume tables. In 4 Poplar stands (two of × *Populus marilandica*/× *P. serotina*, and two of × *P. robusta*; age 15–25 years; trial plots of 0·6–0·75 ha. each) the volume was determined (1) from 10 felled sample trees, and (2) from Blume's volume tables for Poplar, using as criteria (*a*) height only, (*b*) d.b.h. only, and (*c*) height and d.b.h. (i.e. taking the arithmetic mean of the volume readings). The two volumes agreed well, especially (1) and 2 (*c*). The best site class among the four investigated was floodland, the next best, illuvial-humus soils (bog type), and the worst, black soils of bog origin.

4307. KUJALA, V. Die finnische Waldtypenklassifizierung für forstliche Zwecke. **[The Finnish classification of forest types for forestry purposes.]** [*Docum.*] *12th Congr. int. For. Res. Organ., Oxford 1956* No. *IUFRO*/56/21/13, 1956. pp. 4. 9 refs. [G.]

Discusses the adaptation of Cajander's classification to conditions in other countries and climates.

4308. OHMASA, M. **Research on site factors.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/21/10, 1956. pp. 2. 2 refs.

Gives an example of the application of Cajander's ground-vegetation types to Japanese conditions (*Distylium racemosum* forest).

4309. LINTEAU, A. **Forest site classification of the northeastern coniferous section, boreal forest region, Quebec**. *Bull. For. Br. Can.* No. 118, 1955. pp. 78 + 1 dgm. + 1 gph. + 12 photos. 40 refs.

Forest site types were found to fall into 6 broad groups: herb and fern, herb and moss, moss, moss and dwarf shrub, peat moss and dwarf shrub, and lichen and dwarf shrub. These groups and individual types have definite structural characters that can be observed repeatedly over the whole area, and are associated with forests of definite composition and productivity. The main site types are described for their vegetational characteristics and soil conditions, with suggestions for the silvicultural management of the forest stands. Life forms of plants in each site type and in each group or association as a whole indicate that these types grow in different phytoclimatic or ecoclimatic conditions. Except for the most mesophytic communities (the herb and fern group) the general characteristics of the climax forest are its partnership with the feather mosses on moist sites and with peat mosses on humid to wet ones. In the latter case, Black Spruce is the exclusive species, whereas in the former it is co-dominant with Balsam Fir, and in the most mesophytic conditions it is almost excluded to give way to Balsam Fir, White Spruce and White Birch. This gradation in sociological structure is duplicated on the plane of site productivity: height of trees shows a gradual increase, starting from the wet and proceeding towards the moist habitats. Site quality in the various site types is further reflected in rapid turnover of organic matter and site productivity is directly associated with the level of fertility of the humus layer. Significant correlation coefficients have been obtained between level of N, Ca, P, K, Mg, and site quality. *From author's summary.*

4310. MRÁZ, K. Produkční schopnost fytocenologicky definovaných typů stanovišť. **[The productive capacity of ecologically defined site types.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 28 (1), 1955 (123–42). 54 refs. [Cz.cz.russ.g.]

The author investigated *Pinus sylvestris* in stands of the sub-mountain Beech (or Beech/Fir) community; the criteria used were (1) the productivity of the main stand, and (2) the physical and mechanical properties of the wood. The poorest type (*Antennaria-Myrtillus-Dicranum undulatum*), on eluvial clay-slate soil has two variants: (1) *Cladonia*, showing the lowest yield (site class IV/V–V), and poorest strength (compression strength 430–460 kg./sq. cm.); (2) *Pyrola* (on plateaux), having a site-class IV yield, but very high compression strength (540–600 kg./sq. cm.). The two richer types (on diluvial and loess clays), viz. (1) *Luzula pilosa/Polytrichum formosum* and (2) *Rubus fruticosus/Geranium robertianum*, show a higher yield (site class II–III), but compression strength of only 500–580 and 460–520 kg./sq. cm., respectively. These apparent incongruities are explained by the curve of width of growth ring plotted against proportion of late wood. It seems that, in the *Cladonia* variant, a vigorous thinning would increase the very small ring width and hence the strength, whereas in the richer variant, a moderate thinning would improve the wood properties.

55. Age Determination

See No. 4263.

56. Increment. Development and Structure of Stands

See also Nos. 3778, 3796, 3812, 3819, 3827–9, 3834, 3837, 3936, 3939–42, 4127, 4263.

4311. CARBONNIER, C. **Yield study at the Forest Research Institute of Sweden: methods and results.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/25/7, 1956. pp. 8. 8 refs.

The methods employed consist essentially in the application of regression analysis to data derived either from permanent sample plots or (more recently) from single observations of a great number of temporary sample plots with the use of increment cores.

4312. QUARTESAN, O. Ricerche sui lariceti puri della Val di Sole (Trentino). [**Studies in pure Larch stands in the Val di Sole, Trentino.**] *Monti e Boschi* 7 (3), 1956 (133–8). [It.f.e.]

Data from 4 sample plots are set out and discussed. It is shown that, irrespective of site class, stands of the same mean age display the same % of bark and of heartwood relative to diameter.

4313. BRANTSEG, A. Mulighetene for produksjonsøkning ved planting av gran. [**Possibilities of increasing production by planting Spruce [rather than relying on natural regeneration].**] *Tidsskr. Skogbr.* 64 (1), 1956 (10–20). [Nor.]

A comparison of total production (cu.m. over bark/ha.) according to yield tables with measurements in planted and naturally regenerated plots in Østland and Trøndelag show that, particularly in Trøndelag, curves for planted Spruce fall rather above and those for natural regeneration rather below those derived from the yield tables for the same class. Comparison of height growth of planted Spruce and that of natural regeneration on the same sites up to 60 years shows consistently higher values for the planted Spruce. [Cf. *For. Abstr.* 17 (No. 3796).]

4314. ALLISON, J. H., and COLE, C. L. **Growth of 60-year-old Norway (Red) Pine plantation trees in Northern Minnesota.** *Minn. For. Notes* No. 49, 1956. pp. 2.

Remeasurement of these *Pinus resinosa* plantations [cf. *For. Abstr.* 16 (No. 2048)] showed that volumes greatly exceeded those given in yield tables. Density has little effect on height growth. It appears that on good sites, basal-area growth ceases when a level of ca. 250 sq. ft./acre is reached.

4315. BARNES, G. H. **Intermediate yields of Douglas Fir as interpreted from British yield tables.** *J. For.* 54 (3), 1956 (177–9). 7 refs.

Compares the data from U.K. Forestry Commission yield tables [see *For. Abstr.* 15 (No. 2758)] for plantation-grown Douglas with comparable data from young natural stands in the Pacific Northwest, and draws conclusions on the desirability of thinning the latter.

4316. BEGLEY, C. D. **Growth and yield of Sweet Chestnut coppice.** *For. Rec. For. Comm., Lond.* No. 30, 1955. pp. 25 + 11 photos + 1 dgm. Price 2*s*. 6*d*.

Work was carried out by the Research Branch of the Forestry Commission in the winter of 1952–53 to collect information on the yields of Sweet Chestnut coppice. The work was confined to simple coppice, and the aims were: (1) to determine any relationship between height growth and yields; (2) to record the number of shoots per stool and stools per acre and determine whether any relationship exists between these numbers and yields; (3) to determine gross yield, and yield in terms of outturn of different sizes and classes of produce at rotations of 16 and 17 years for coppice grown on 4 sites. The results are given in tables and discussed. In regard to (1), no simple relationship was established, but where large differences in height growth were recorded, the plots with greatest average height growth (per shoot) at a given age had the greatest volume and weight of Chestnut. It is suggested that mean height per shoot might be used as an indication of quality class provided that only two classes (good and other) were recognized. In regard to (2), no clear relationship was established. In regard to (3) the investigation showed that the average yield that may be expected from an acre of Chestnut coppice managed on a rotation of 16–17 years is ca. 52 tons of (freshly felled) Chestnut (the whole production, including twigs), equivalent to an annual production of ca. 3 tons/acre. The corresponding figures for material 2½ in. diameter (over bark) and at least 3 ft. long, is total yield 34 tons/acre, annual production 2 tons/acre.

561. Increment in Height, Diameter, Basal Area, Form and Quality. Variations and Trends; Dendrochronology

See also Nos. 3738, 3907, 3940, 3942, 4178, 4266–7, 4278–9.

4317. FAITH, J. Raznicový prírastomer. [**A punch device for taking increment cores.**] *Les, Bratislava* 2 (6), 1955 (249–53). [Slovak.]

Illustrated description of an increment borer developed by B. Doležal in 1949–52, and of a modification developed by Burgan and Košut in 1954. In its final form, a steel tube (borer) 6·5 cm. long is inserted [screwed?] into a steel head (1·6 cm. long and with an external screw-thread), the end of which is struck with a hammer. The tube and head are withdrawn from the tree by means of a hollow steel key, threaded internally to engage the external thread of the head-piece, and turned with the aid of a steel rod passed through holes in its sides. The increment core is extruded by means of an ejector pin. The whole device (without hammer) weighs 280 g.

4318. MIKOLA, P. **Tree-ring research in Finland.** *Tree-Ring Bull.* 21 (1/4), 1956 (16–20). 21 refs.
A review article.

4319. HØEG, O. A. **Growth-ring research in Norway.** *Tree-Ring Bull.* 21 (1/4), 1956 (2–15). 35 refs.
A review article.

4320. HUBER, B., and JAZEWITSCH, W. VON. **Tree-ring studies of the forestry-botany institutes of Tharandt and Munich.** *Tree-Ring Bull.* 21 (1/4), 1956 (28–30). 26 refs.
A review article.

4321. JAZEWITSCH, W. VON, SIEBENLIST, H., and BETTAG, G. Eine Synchronisiermaschine zum Vergleich von Jahrringkurven und eine langjährige Eichenchronologie. **[A synchronizing machine for the comparison of annual-ring curves, and a long-term Oak dendrochronology.]** *Ber. dtsch. bot. Ges.* 69 (3), 1956 (128–42). 19 refs. [G.g.] O.B.D.
Describes an apparatus based on the Hollerith principle, by which the agreement can be tested between two sets of annual-ring curves. Data are presented on the dendrochronology of Oak in Germany, obtained by use of this machine.

4322. WECK, J. Beiträge zur Beziehung: Witterung — Zuwachsschwankung — Zuwachsmessung. **[Notes on the relation between weather, variations in increment, and measurement of increment.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ, Oxford 1956* No. *IUFRO*/56/25/4, 1956. pp. 4 + 2 gphs. 7 refs. [G.] [Bundesforschungsanstalt fur Forst- und Holzwirtschaft, Reinbek-bei-Hamburg.]
Summarizes observations made in Germany over a period of 25 years, discusses the meteorological and other factors involved in variations in width of growth rings, and stresses the importance of the precipitation/temperature ratio.

4323. BOURGUENOT, L. Influence des conditions météorologiques sur la production forestière. **[Influence of meteorological conditions on increment.]** *Bull. Soc. for. Franche-Comté* 29 (1), 1956 (1–17). 9 refs. [F.]
Data derived from the revision of working plans for several stands of *Abies alba* in the Jura, together with meteorological records for the area, show a close correlation between the falling off of m.a.i. (26–40%) especially for the older trees and stands, since 1942 or 1943, and a distinct climatic change (an absolute diminution in precipitation and a change in seasonal distribution so that rainfall for the growing season since ca. 1942 has been 19–20% below the mean). The change has led to long periods of drought and a much less abundant snowfall.

4324. HOLMSGAARD, E. **Effect of seed-bearing on the increment of European Beech (*Fagus sylvatica* L.) and Norway Spruce (*Picea abies* (L.) Karst.).** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/25/5, 1956. pp. 3. 2 refs.
Since seed-years, at least in these two species, mask the increment variations due to climatic factors, it is important that investigations of the relation between increment and climatic variations should be made on young stands that have not yet reached seedbearing age. [Cf. *For. Abstr.* 16 (No. 4404).]

4325. LARSON, P. R. **Discontinuous growth rings in suppressed Slash Pine.** *Trop. Woods* No. 104, 1956 (80–99). 59 refs.
Increment cores from 25 trees in a 32-year *Pinus elliottii* stand could all be matched by an exceptionally narrow 1931 ring, from which the full complement to 1952 is 23 rings. In 5 trees, all suppressed, the number was less. The discontinuity of these rings, both in the direction of their circumference and vertically, is shown in diagrams based on discs cut at intervals up the stem. All discontinuous rings were of the fused-latewood type. Localised auxin deficiency is suggested as the cause.

562. Volume Increment

4326. MAGIN, R. Die Mortalität in mehrschichtigen natürlichen Fichten-Tannen-Buchen-Bergwäldern. **[The mortality in many-storeyed natural mixed montane forest of Spruce/Silver Fir/Beech.]** [*Docum.*] *12th Cong. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/25/2, 1956. pp. 3. [G.]
Discusses in general terms the difficulties inherent in the complex processes involved in determining mortality in such stands, where different storeys as well as different species are involved.

4327. MINE, I. **Mortality from natural causes.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/25/3, 1956. pp. 2.
A very brief note on studies of natural mortality in mainly coniferous virgin forest in Japan.

4328. HUBBARD, J. W. **Growth and mortality in a Northern Minnesota forest.** *Minn. For. Note* No. 50, 1956. pp. 2.
Data derived from remeasurement, after 5 years, of 558 permanent ⅕-acre plots are presented and analysed. A separate growth tabulation was made for *Populus tremuloides*, which has an almost straight-line growth curve, and *Abies balsamea*, which grows slowly up to 6 in. d.b.h., then accelerates greatly until about 10 in. d.b.h., when the growth rate levels off.

564. Forecasting Increment

See also No. 4332.

4329. BEDELL, G. H. D., and MACLEAN, D. W. **Empirical stand density yield tables for the boreal forest of eastern Canada.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/25/6, 1956. pp. 6. 8 refs.
Cf. *For. Abstr.* 17 (No. 3116).

566. Yield Tables and Their Construction

4330. Rehak, J. Ein auf mathematisch-statistischen Methoden beruhender Vorschlag der Aufstellung von Ertragstafeln auf Grund des Mittelstammes. **[The contruction of yield tables on the basis of the mean [sample] tree using statistical analysis.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/25/18, 1956. pp. 7. [G.] [Forest Research Institute, Zbraslav-Strnady, Czechoslovakia.]

567. Stand Tables

4331. Rudolph, V. J. **Stand conditions in the old-growth hardwoods of the Fred Russ Forest in Southwestern Michigan.** *J. For.* 54 (4), 1956 (249–54). 4 refs.

Gives a detailed account of a 40-acre stand of quasi-natural *Quercus alba*/*Q. velutina*/*Acer saccharum*/other hardwoods in the Michigan State University forest, with a stand table and graphs of distribution by diameter classes of volume, b.a., log grades, and trees/acre. The Sugar Maple is replacing Oak, which has produced no regeneration for a century.

568. Other Mensurational Studies of Stand Constitution and Changes Therein. Distribution of Growth by Tree Classes etc.

See also Nos. 4329, 4343.

4332. Casamajor, P. **A forest growth study.** *Proc. Soc. Amer. For. 1955*, 1956 (154–7).

Describes the methods used for determining the future increment (by species) and stand structure at any time within the next 50 years of an area of mixed Ponderosa Pine, Incense Cedar (*Libocedrus decurrens*) and White Fir (*Abies concolor*) logged to a 20-in. minimum diameter limit.

569. Increment; Development and Structure of Stands: Miscellaneous

4333. Hildebrandt, G. Untersuchungen an Fichtenbeständen über Zuwachs und Ertrag reiner Holzsubstanz. **[Investigations in Spruce stands on the increment and yield of pure woody matter [on a weight basis].]** Deutscher Verlag der Wissenschaften, Berlin. 1954. pp. 133 + 1 tbl. 70 refs. [G.g.] Price *DM.*14·00 [£1.1*s.* 5*d.*]

Records investigations into the oven-dry density [oven-dry wt./oven-dry vol.] of > 2000 wood samples taken from all parts of 30 Spruce stems, of which 6 came from near Tharandt, and the rest from thinning trial plots in the Harz mountains, analyses them statistically and discusses them from the point of view of tree statics. From these data, corresponding figures for basic density (b.d.) [oven-dry wt./max. volume (*Raumdichte*)] expressed in kg./cu.m. are computed, and applied to ascertain mean values for individual trees and successive layers of wood in each tree, for trees of various ages, and trees belonging to different diameter and crown classes. Weight-increment curves for individual trees, expressed in kg. of dry wood produced, followed volume increment curves closely, but reduced the differences between the best and the poorest trees in a stand. Methods of arriving at a mean b.d. for whole stands are then discussed, and the m.a.i. and yield, computed for various stands in terms of weight of dry wood, are compared with each other and with the corresponding data expressed in cu.m., with reference to the effects of site, climate, and silvicultural treatment. Mean b.d. of dense stands was generally greater than that of widely spaced ones, and total yields of moderately thinned stands, expressed in kg. of dry wood, were clearly superior to those of very heavily thinned stands. The importance of Spruce wood of high density, both for the building and the pulping industry, is stressed.

58. Surveying and Mapping. Aerial Surveys

See also No. 4231.

4334. Bitterlich, W. Schallmesstechnik in der Forsteinrichtung. **[The use of [distance] measurements by sound in forest management.]** *Allg. Forstztg.* 64 (1/2), 1953 (14–25). 1 ref. [G.]

Describes instruments for determining nodal points for a triangular grid in the forest in connexion with systematic sampling techniques, and their use. Three workers, A, B, and C, are each equipped with an electric clock mechanism to which 3 small lamps and an electric horn are connected in such a manner that the lamps light up, one after another, for exactly ⅓ of a second each, and the horn is sounded automatically for the first third of each second. After the clocks have been synchronized, A starts his horn, and B walks away until his hearing of the horn coincides with the flash of his own third lamp. He will then be 200 m. away [the time taken by the sound to travel that distance being ⅔ of a second]. He now starts sounding his horn (which should preferably be of a different pitch) in order to guide C to a point where he will hear both horns simultaneously with the flash of his third lamp. In this manner any number of points, each equidistant from 2 others by 100, 200, or 300 m., can be determined quickly and objectively.

4335. Spurr, S. H. **History of forest photogrammetry and aerial mapping.** *Photogramm. Engng.* 20 (3), 1954 (551–60). 82 refs. L.S.

4336. Mott, P. G. **The contouring of a tropical forest area in Ceylon by the use of aerial photographs.** *Emp. For. Rev.* 35 (1), 1956 (36–41). (*Repr.* from *Photogrammetric Engineering*, June 1955.)

Gives details of an aerial survey, much of which was checked on the ground by traditional methods. From the results it appears that aerial survey is faster, cheaper, and up to the standards of ground survey.

4337. Sims, W. G. **Shadow point.** *Leafl. For. Timb. Bur. Aust.* No. 67, 1954. pp. 3 + 1 dgm. + 4 photos.

Insufficient attention has been given to the appearance and shape of the shadows of objects appearing on vertical aerial photos when the height of these objects is to be measured by parallax methods. In particular, the differing shadows of trees influence the stereoscopic model, probably because trees are relatively small as features on the earth's surface, and because of their abrupt erectness and habit of close contiguity. When the tree tops of forests are seen by an observer in an aircraft, those trees directly opposite to the sun (if a line could be drawn from the sun through the aircraft to the point on the ground where the aircraft's shadow would fall if it were sufficiently low to cast one) cast no shadows which are observable from the aircraft carrying the camera, because the tree crowns in that restricted area exactly match their own shadows' shapes and dimensions. The term 'shadow point' is given to this point and its variation with latitude, time of day etc., and the difficulties it causes in interpretation of aerial photos are discussed.

4338. Stanecki, M. Dokładność fotogrametrycznego pomiaru wysokości drzew i drzewostanów. **[Accuracy of photogrammetric measurements of tree and stand heights.]** *Roczn. Nauk leśn.* No. 13, 1955 (45–57). 9 refs. [Pol.pol.russ.e.] (*Prace Inst. bad. Leśn.* No. 146.)

Nearly 800 measurements were made from (1) uncorrected and corrected photographs, using the parallax ruler, and (2) lantern slides using Wild's A5 'Autograph'. Errors in measurements of stand height proved greater than those for single trees, for which several reasons are adduced. No substantial difference in accuracy was found between uncorrected and corrected photographs. Method (2) involved about ⅔ of the error found with (1). The author concludes that the accuracy of photogrammetric measurements of stand and tree height is sufficient for the purposes of forest management.

4339. Worley, D. P., and Landis, G. H. **The accuracy of height measurements with parallax instruments on 1 : 12,000 photographs.** *Photogramm. Engng.* 20 (5), 1954 (823–9). 9 refs. L.S.

The accuracy of aerial tree-height measurements made by experienced photo interpreters, two using an Abrams parallax bar and two using the Harvard wedge, was determined for trees of different species and different heights, and for trees growing under different conditions. The results show that the systematic errors of height measurements differ for the two instruments investigated, being larger for the parallax bar than for the parallax wedge. For both instruments these errors are greater for conifers than for hardwoods, and greater for large trees than for small. A table of correction factors to compensate for these systematic errors is presented. On the other hand, the accidental errors of measurement, expressed as standard errors, were found to be 8–10 ft. regardless of interpreters or of any of the other factors considered in the investigation. *Authors' summary.*

6. FOREST MANAGEMENT. BUSINESS ECONOMICS OF FORESTRY. ADMINISTRATION AND ORGANIZATION OF FOREST ENTERPRISES

61. Forest Management: General, Theory and Principles

See Nos. 3772–4, 4302, 4341, 4636, 4653.

62. Working Plans. Annual or Periodic Yield. Yield Regulation

4340. Hughes, W. G. **Management plan considerations in initiating sustained yield forestry.** *Emp. For. Rev.* 35 (1), 1956 (29–35). 3 refs.

A paper presented to the Society of American Foresters on the work and problems involved in establishing proper management plans in British Columbia.

4341. Grosenbaugh, L. R. **Better diagnosis and prescription in Southern [U.S.A.] forest management.** *Occ. Pap. Sth. For. Exp. Sta.* No. 145, 1955. pp. 27. 9 refs.

The author suggests that 'stands' should be replaced as units of management and of record by 'operating areas', varying in size between 40 and 1000 acres. The treatment prescribed may, however, vary within the unit according to distribution of tree classes, density etc. A new code of classes for mature trees and regeneration, according to their development potential and likely effect on others, is proposed, and an exposition of plotless sampling, with supporting tables and sample tally sheets, is given.

4342. Groome, J. S. **Muninga (*Pterocarpus angolensis* D.C.) in the Western province of Tanganyika. III Yields, yield control, and management.** *E. Afr. agric. J.* 21 (4), 1956 (248–54). 9 refs.

[Cf. *For. Abstr.* 17 (No. 4263).] Gives such figures as are available of past and present yields, and estimated figures for future yields, and considers briefly management after preliminary surveys of Muninga areas have been made.

4343. Silvy-Leligois, P. Description des peuplements en évolution. **[The description of stands with reference to their state of development.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/23/3, 1956. pp. 10 + 1 tbl. 7 refs. [F.e.g.] [Station de Recherches Forestières, Nancy.]

Discusses in general terms the problems involved in attempting a dynamic description of a forest stand, and gives a suggested notation by the use of symbols to represent: normal growth and development, satisfactory natural regeneration, premature or invading regeneration, ageing without regeneration, and deviation from the normal, for uniform stands of one or of two storeys and for selection forest.

4344. Abetz, K. Die Hiebssatzherleitung in der deutschen Bundesrepublik. **[Yield determination in the German Federal Republic.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/25/11, 1956. pp. 3. [G.]

Summarizes the methods currently used.

4345. Hummel, F. C. **A note on the improvement of abnormal age class distribution.** [*Docum.*] *12th*

Congr. int. Union For. Res. Organ., Oxford 1956 No. *IUFRO*/56/25/15, 1956. pp. 3.

Very abnormal age-class distributions are common in newly created forests. The object of this note is to stimulate an exchange of views by briefly describing the methods by which the U.K. Forestry Commission is trying to improve the age- and size-class distribution of forests in Great Britain.

4346. BORCHERS. Waldbauliche Zielsetzungen zur Ertragssteigerung auf diluvialen Standorten. **[Silvicultural policies for obtaining increased yields on diluvial sites.]** *Forst- u. Holzw.* 11 (12), 1956 (243–9). [G.]

Discusses the rôle of general directives on local choice of species and treatments in state forests of Lower Saxony, e.g. increased attention to hardwoods, to vertical structure, and to State production of slow-growing timber and large dimensions. Contains some data on the present composition of these forests by species and age classes, and on the great climatic differences, particularly as regards insolation, between various parts of the country.

64. Forestry as a Business: General

4347. REYNOLDS, R. R. **Managed growth.** *Occ. Pap. Sth. For. Exp. Sta.* No. 142, 1955. pp. 16.

A report on 15 years of selection management in the Crossett Experimental Forest, Arkansas, of mixed Pine/low-grade hardwood second growth, giving figures for original stocking, stand development under various treatments and cutting cycles, forest produce harvested, financial returns and costs. [Cf. *For. Abstr.* 15 (No. 1685).]

65. Special Business Problems of Timber-Growing. Calculation of Costs and Profitability. Valuation

See also Nos. 3794, 3796, 3822, 3939, 4065, 4656.

4348. NAKAYAMA, T. **[On the character of forestry capital. [Characteristics of forestry as a capitalistic enterprise. An analysis of forest-rental theory].]** *For.* [*industr.*] *Econ., Tokyo* 9 (2; 3) 1956 (4–15; 8–16). [Jap.]

4349. HILEY, W. E. **The cost of planting in Great Britain.** *Emp. For. Rev.* 35 (1), 1956 (85–7).

A comparison is made of some items in the Surveys of Private Forestry Costs for England and Wales and for Scotland respectively [cf. *For. Abstr.* 17 (Nos. 735, 1883)]. The most influential factor in the cheaper establishment of plantations in Scotland appears to be the lightness of weed growth.

4350. LEIBUNDGUT, H. Die Baumartenwahl als biologisches und wirtschaftliches Problem. **[The choice of species as a biological and economic problem.]** *Schweiz. Z. Forstw.* 107 (4), 1956 (226–49). 16 refs. [G.g.f.]

On the basis of present-day prices for various kinds and assortments of wood, for which graphs are presented, comparisons are made between the value production (main crop plus intermediate yields, if any, disregarding interest) of Beech and Oak/Spruce stands under various treatments (showing considerably higher totals for heavily thinned than for lightly or unthinned stands) and of different species on one site (where Larch was superior to Beech and to Beech/Larch mixture) over a period of 50 years. The great differences in value production possible within the framework of the close-to-nature school are stressed, along with the need for further fundamental investigations.

4351. HALLIN, W. E. **Planting Ponderosa Pine is a good investment.** *For. Res. Note Calif. For. Range Exp. Sta.* No. 104, 1956. pp. 5. 2 refs.

Presents tables showing, at discounts from 2 to 6%, the present-day value per acre of interim and final harvests (reduced by pruning charges, also discounted) for a number of site indexes and rotations, and the assumptions as to yields and stumpage rates etc. on which they are based. At present costs of ca. $70/acre, planting is considered a good investment on the better sites.

4352. BENNETT, F. A. **Financial aspects of pruning planted Slash Pine.** *Sta. Pap. Stheast. For. Exp. Sta.* No. 64, 1956. pp. 9. 3 refs.

Computes the cost per tree of pruning up to 8 ft. when the trees are 15 ft. tall, and up to 17 ft. when they have reached 33 ft., the additional clear lumber produced in the butt log at various ages, and the net profit to be expected.

4353. GUTTENBERG, S. **Influence of timber characteristics upon stumpage prices.** *Occ. Pap. Sth. For. Exp. Sta.* No. 146, 1956. pp. 14. 7 refs.

A study of Southern Pine sawtimber sales from National Forests in Mississippi, Louisiana, and Texas.

4354. WILLIAMS, E. T. **State guides for assessing forest land and timber.** U.S. Forest Service, Washington. 1956. pp. 52.

A compilation of excerpts from guides to the assessment of forest land and timber for taxation purposes, in the various states of the U.S.A.

66. Costing of Logging Operations

See also No. 4031.

4355. **Logging costs by volume cut and type of cutting.** *Rep. Stheast. For. Exp. Sta. 1955*, 1956 (22).

In a 6-year summary, costs varied little in relation to volume cut per acre or methods of cutting. Removal of 6 seed-trees/acre cost little more per unit volume than the removal of 5 times as many in a clear-felled strip, nor did an annual selection felling of < 1000 bd. ft./acre.

67. Assessment of Financial Results; Book-keeping and Accountancy; Business Statistics; Short-Term Planning and Financing

See also No. 4347.

4356. MELZER, E. Aufgabe, Methodik und Organisation einer forstlichen Kostenrechnung (dargestellt an der Kostenrechnung der staatlichen Forstwirtschaftsbetriebe der deutschen demokratischen Republik). **[Cost accounting in forestry**

enterprises, illustrated by the cost accounting of the State Forest Service of the D.D.R. [Eastern Germany].] [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/31/7, 1956. pp. 8 + 1 dgm. [G.]

4357. ABETZ, K. Zum Problem der Zurechnung der Kosten in der Forstwirtschaft. **[The problem of allocating costs in forestry.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/31/2, 1956. pp. 4. 5 refs. [G.]

Briefly discusses the relation of costs to (*a*) sustained total yield, (*b*) individual species or timber assortments, (*c*) the growing and harvesting of wood and (*d*) forestry proper and other activities (e.g. sawmilling, minor forest products).

7. MARKETING. ECONOMICS OF TRANSPORT AND THE WOOD INDUSTRIES

71. Marketing of Forest Products: General

See also No. 4372.

4358. HAMMERLE, W. C. **Merchandising Southern Pine lumber.** *J. For.* 54 (5), 1956 (307–10). [Southeastern Pine Marketing Institute, Savannah, Georgia.]

72. The Quantitative Aspects of Marketing. Demand, Consumption and Supply

See also No. 4620.

4359. Statistiques de production et d'échanges des bois tropicaux en 1954. **[Statistics of production and international trade in tropical timbers in 1954.]** *Bois For. Trop.* No. 47, 1956 (37–48). [F.]

Gives statistics for imports (1) by provenance, (2) by species, for Western Germany, Austria, Belgium, Denmark, France, Italy, Norway, Netherlands, Portugal, the United Kingdom, Sweden, and Switzerland.

4360. TSOUMIS, G. T. Ekmetalleusis tou xylou eis tēn Hellada. **[Wood utilization in Greece.]** *Repr.* from *Geopōnika, Thessalonika* Nos. 14; 15/16, 1955. (403–6; 434–7). [Gk.]

Figures of wood production from the forests of Greece from 1922 to 1954 and of imports for the same period are presented. Current methods of logging, primary and secondary conversion, seasoning and preservation are briefly discussed and suggestions made for improvement and research.

4361. TURNBULL, R. F. **Pattern of timber utilization in Australia.** *Aust. Timb. J.* 22 (2), 1956 (183 . . . 203). [Division of Forest Products, C.S.I.R.O., Melbourne.]

A detailed and comprehensive survey with data for 1954 on resources and yield, cut, wood and timber production, availability to consumer by States, current supplies of chief timbers (including imports), conversion and trade practices, uses of timber by various trades, and utilization trends.

73. Prices

4362. **Comparative imported timber prices. Fluctuations during the past thirty years in Finnish, Russian and Swedish softwood.** *Timb. Tr. J.* 217 (4154), 1956 (100).

Taking a 'bread and butter' class of imports, 7-in. unsorted Redwood battens, the prices at the first open-water shipment for 1926–56 are quoted, with some adjustments for exchange etc. Prices have risen about sixfold in the period.

75. Trade Customs and Usages

4363. WHITMAN, J. A. **A checklist for timber sale contracts.** *J. For.* 54 (4), 1956 (246–8).

Discusses the 25 clauses that should form part of such contracts. [Cf. *For. Abstr.* 16 (No. 818).]

4364. SGERM, F. Problem zaokroževanji pri merenju žaganega lesa. **[The problem of rounding-off in the measuring of sawn timber.]** *Les, Ljubljana* 7 (10), 1955 (143–7). [Sloven.]

The conventional rounding-off downwards in sales of sawn timber is not justified if the wood is air-dry. When the rounding-off is to the nearest mm., cm., and dm. (for thickness, width, and length respectively), the loss to the seller is ca. 2%. The author advocates using scales in which all divisions would be shifted a ½ unit to the right.

79. Economics of the Wood Industries

4365. **Interim report on wooden case industry in South Australia.** Commonwealth Forestry and Timber Bureau, Canberra. 1955. pp. 10. (Also in *Aust. Timb. J.* 22 (1), 1956 (36 . . 42, 105).)

[Cf. *For. Abstr.* 16 (Nos. 3313–4).] Up to 48 million super. ft. p.a. are used, almost all *Pinus radiata*, and > 50% being for packing fruit, fresh vegetables and dairy products.

4366. CREIGHTON, J. W. **A short system for prorating direct labor cost in furniture plant rough mills.** *For. Prod. J.* 6 (3), 1956 (108–10).

Presents tables and describes how cost ratios between different lumber grades and cutting lengths may be used for this. [Cf. *For. Abstr.* 17 (No. 3352).] *From author's summary.*

4367. VIRKKUNEN, M. **On the credits granted to the timber industry.** *Econ. Rev., Helsinki* 1954 (3), (99–112). [E.]

Distinguishes between permanent and seasonal credits to wood-using industries, and analyses the proportion of the latter supplied by commercial banks, by buyers and sellers etc., with particular reference to foreign credits, the greater part of which come from the U.K.

4368. WEINHOLD, W. Der Leistungslohn in der Holzindustrie. **[Payment by results in the wood industries.]** *Holz-Zbl.* 82 (53/54), 1956 (679–81). [G.]

A discussion of various incentive systems and their applicability to the wood-using industries, with examples from U.S.A. and Eastern Europe.

8. FOREST PRODUCTS AND THEIR UTILIZATION

See also Nos. 4360–1.

4369. Seabra, L. de, and Ferreirinha, M. P. Laboratório de Histologia e Tecnologia de Madeiras da Junta das Missões Geográficas e de Investigações do Ultramar. Notas acerca da sua actividade. **[The wood anatomy and technology laboratory of the [Portuguese] Society for Overseas Research and Geographical Expeditions. Notes on its activities.]** *Agros* 38 (3/6), 1955 (369–81). 35 refs. [Port.]

A short review of the laboratory's foundation and of its work.

4370. On nous a demandé. **[We have been asked.]** *Bois For. Trop.* No. 46, 1956 (48–54). [F.]

A selection of answers given by the C.T.F.T. at Nogent-sur-Marne to enquirers. The following questions are dealt with: Treatment of *Musanga* seed to promote germination; Use of Teak thinnings as telegraph poles; Seasoning schedules for *Tarrietia utilis*; Manufacture of rayon pulp from Eucalypts; French chipboard factories; Comparative merits of Oak and *Lophira* sleepers.

4371. **Abstracts of [26] papers, FPRS tenth national meeting.** *For. Prod. J.* 6 (3), 1956 (25*A*–28*A*.).

Subjects comprise: sampling for quality control (4 papers), preservation of wood and board products in buildings (6), gluing (4), chemicals from wood and bark (3), logging and milling (5), finishing and packaging of furniture (4).

4372. **Abstracts of [26] papers, FPRS tenth national meeting.** *For. Prod. J.* 6 (4; 5), 1956 (33*A*–35*A*; 37*A*).

Subjects comprise: Preservation of wood (1 paper), marketing (1), gluing (2), drying (3), chemicals from wood and bark (3), machining (4), logging and milling (1), composition boards (3), plywood (4), and furniture, finishing and packaging (4).

81. Wood and Bark: Structure and Properties

See also No. 4649.

810. General Information on Woods

See also Nos. 3646, 3693–4, 3827, 4417, 4620.

4373. **Combined report on the properties of thinnings of home-grown Sitka Spruce (*Picea sitchensis*).** Forest Products Research Laboratory, Princes Risborough. 1956. pp. 11 + 8 photos.

Summarizes and presents the conclusions drawn from a series of investigations on Sitka Spruce [already referenced individually; see *For. Abstr.* 16 (No. 3325)], to determine the general properties of the timber of thinnings taken from plantations in relation to the site and soil.

4374. **Properties of thinnings of home-grown Douglas Fir (*Pseudotsuga taxifolia*). Progress report 1—Consignment No. 787.** Forest Products Research Laboratory, Princes Risborough. 1955. pp. 7 + 10 photos. Limited distribution.

4375. **Properties of thinnings of home-grown Western Red Cedar (*Thuja plicata*). Progress report 1—Consignment No. 786.** Forest Products Research Laboratory, Princes Risborough. 1955. pp. 7 + 1 photo. Limited distribution.

4376. **A handbook of hardwoods.** H.M. Stationery Office, London. 1956. pp. 269. Price 17*s.* 6*d.*

It has been decided to revise and enlarge the scope of the *Handbook of Empire Timbers* [see *For. Abstr.* 7 (No. 1799)] and the *Handbook of Home-grown Timbers* [see *For. Abstr.* 3 (p. 218)], grouping the hardwoods and softwoods in separate volumes, but bringing together both home-grown and imported timbers in each class. There are full descriptions of 151 timbers and brief descriptions of 64 more, arranged, with a few exceptions, alphabetically under the [British standard] trade name. Information given under the individual species covers a general description of the wood, seasoning, mechanical properties, bending properties, resistance to insect attack, natural durability, amenability to preservative treatment, working properties, suitability for veneer and plywood, and uses. Appendices give this information briefly in tabular form, and show types of saw and kiln schedules recommended for timbers with different properties.

4377. Fernando, X. M. **Notes on Ceylon timbers.** *Ceylon For.* (*n.s.*) 2 (3), 1956 (131–8). 11 refs.

Anatomical structure, mechanical properties, working qualities etc., of *Adina cordifolia*, *Alseodaphne semecarpifolia*, *Albizzia lebbek*, and *Melia azadirachta*.

4378. **Specimen woods Nos. 244–246.** *Suppls.* to *Wood* 21 (4–6), 1956. Each pp. 2.

Seraya Punai (*Shorea parvifolia*), Mucarala (*Burkea africana*) and Bintangor (*Calophyllum* spp., excluding *C. inophyllum*). From No. 245 on, the series includes structure drawings [cf. *For. Abstr.* 17 (No. 4390)].

4379. Brazier, J. D. **Meranti, Seraya and allied timbers.** *Bull. For. Prod. Res., Lond.* No. 36, 1956. pp. 38 + 4 plates + 1 tbl. 31 refs.

Correlates trade and native names of species of *Shorea*, *Parashorea*, *Pentacme* and *Anisoptera* with each other and with the corresponding botanical species, describes briefly the botanical composition and economic importance of the timbers in the countries supplying them and indicates the chief points of resemblance and difference in physical and mechanical properties.

4380. Kukachka, B. F. **Information leaflet. Foreign woods. Palosapis. *Anisoptera* spp.** *Rep. U.S. For. Prod. Lab., Madison* No. 2051, 1956. pp. 5. 9 refs. P.R.

4381. **Mushabarara, *Drypetes* sp. aff. *D. battiscombei*.** *Timb. Leafl. For. Dep. Uganda* No. 26, 1955. pp. 2.

Briefly describes the tree, its distribution and frequency, and the properties and uses (joinery and cheap furniture) of its timber. The native name given is the suggested standard name.

4382. **Muchenche, *Newtonia buchanani*.** *Timb. Leafl. For. Dep. Uganda* No. 27, 1956. pp. 2.

Briefly describes this tree, formerly known as *Piptadenia buchananii*, its distribution and frequency, and the properties and uses (carpentry, joinery, utility furniture) of its timber. The native name given is the suggested standard name. Kiln Schedule J (F.P.R.L. Leaflet 42) is recommended.

4383. **Properties of Australian timbers. Blackbutt [*Eucalyptus pilularis* Sm.].** *For. Prod. News Lett. C.S.I.R.O. Aust.* No. 216, 1956 (3).

Covers its habit, distribution, timber properties, uses and availability.

4384. **Timbers of New South Wales. Red Bloodwood [*Eucalyptus gummifera*].** *Tech. Notes For. Comm. (Div. Wood Technol.) N.S.W.* 9 (1/4), 1956 (2–5).

Range, botanical description, micro- and macroscopic characters of the timber, its uses, durability, seasoning and physical and mechanical properties.

4385. La page des bois tropicaux. Sipo (Assie). **[Tropical woods: *Entandrophragma utile*.]** *Rev. Bois Appl.* 11 (4), 1956 (33). [F.] P.R.

4386. Bilinga. **[*Sarcocephalus diderrichii*.]** *Bois For. Trop.* No. 47, 1956 (11–4). [F.]

4387. Huynh. **[*Tarrietia javanica*.]** *Bois For. Trop.* No. 46, 1956 (29–32). [F.]

811. Structure, Identification

4388. LEBACQ, L. Atlas anatomique des bois du Congo Belge. **[Anatomical atlas of timbers of the Belgian Congo. Volume 1. Spermatophytes—Podocarpaceae, Cupressaceae, Ulmaceae, Moraceae, Proteaceae, Olacaceae. Volume II. Spermatophytes—Annonaceae, Myristicaceae, Monimiaceae, Lauraceae, Capparidaceae.]** Institut National pour l'Étude Agronomique du Congo Belge (I.N.É.A.C.), Brussels. 1955. pp. 26 + 32 + 1 tbl. + 32 plates; pp. 36 + 1 tbl. + 36 plates. [F.] Price *Fr.*250 each volume.

Consists of an introduction, with notes on identification, and descriptions in loose-leaf form with photomicrographs of cross, tangential and radial sections for each species described (32 in Vol. 1 and 36 in Vol. 2). Each volume has an index and a synoptic table of characters. The final volume will contain a key to the identification of ca. 500 species.

4389. VANDER WYK, R. W., and CANRIGHT, J. E. **The anatomy and relationships of the Anonaceae.** *Trop. Woods* No. 104, 1956 (1–24). 30 refs.

From the examination of 489 species of 79 genera of Annonaceae and 31 genera of 6 related families, it is concluded that, with the possible exception of vessels/sq. mm. and ray size, anatomical features overlap too much to define intrafamily relationships. This family should be transferred to the Magnoliales, since it shows a strong affinity with Degeneriaceae, Magnoliaceae and Himantandraceae, particularly the last.

4390. JOHNSTON, D. R. **Structure drawings to 'Specimen woods'. Sheet 58.** *Wood* 21 (4), 1956 (132).

Mukui (*Piptadenia buchananii*), Seraya Punai (*Shorea parvifolia*), and Weli-penna (*Anisophyllea cinnamomoides*). [This series ends with the present sheet. It is intended that in future, each issue of *Specimen Woods* [see *For. Abstr.* 17 (No. 4378)] will include a structure drawing.]

4391. RABECHAULT, H. Sur l'anatomie du giroflier *Syzygium aromaticum* (L.) Merrill et Perry. **[The anatomy of *S. aromaticum* [*Eugenia caryophyllata*].]** *Agron. trop.* 10 (4), 1955 (449–84). 31 refs. [F.f.e.span.]

A detailed study of the anatomy of wood (root, branch, and stem), leaf, flower, and fruit.

811.1. Anatomical Elements and Tissues

See also No. 4545.

4392. CHATTAWAY, M. M. **Crystals in woody tissues. Part II.** *Trop. Woods* No. 104, 1956 (100–24). 4 refs. [Division of Forest Products, C.S.I.R.O., Melbourne.]

This part deals with the more commonly occurring crystals of little or no diagnostic value, those of diagnostic value having been dealt with in Part I [see *For. Abstr.* 17 (No. 1930)]. Over 600 species of more than 90 genera were examined and the occurrence of crystals in a subdivision of the cell, in enlarged cells, and within sclerosed walls, assorted sizes of crystal in the same cell, and the tissue in which they occur, are tabulated. Other species noted from the literature as containing crystals are listed.

4393. BANNAN, M. W. **Some aspects of the elongation of fusiform cambial cells in *Thuja occidentalis* L.** *Canad. J. Bot.* 34 (1), 1956 (175–96). 108 refs. O.R.S.

A discussion, based on observations and on literature, of the growth cycle, polarity in elongation of fusiform initials, site and mode of elongation of cambial cells, and terminal shortening of fusiform initials.

4394. SEBASTINE, K. M. **Studies on the variations in the structure and size of rays in the secondary wood.** *J. Indian bot. Soc.* 34 (4), 1955 (299–306 + 1 plate). 18 refs. O.B.D.

Observations on *Pajanelia rheedi*, *Erythrina stricta*, *Macaranga peltata*, *Tabernaemontana dichotoma* and *Anacardium occidentale*. The height of the ray varies widely from point to point along a given radius at the same level in the stem, and also at different levels in the stem. The mean width of the ray increases towards the periphery of the stem along a given radius. This increase is due largely to an increase in the number of cell series constituting the width of the ray, but also partly to a slight increase in the size of certain cells in its outer region. The type character of the ray, however, remains constant.

811.2. Special Features and Abnormal Structure

4395. Moseley, M. F., Jr. **The anatomy of the water storage organ of *Ceiba parvifolia*.** *Trop. Woods* No. 104, 1956 (61–79). 25 refs.

These *camotes*, measuring up to 30 cm. in diameter, appear on the roots. They are anomalous, with characters suggestive of root, stem and callus. They are largely composed of highly parenchymatous secondary xylem, a feature of the wood of other Bombacaceae e.g. Balsa. Their function is probably water storage.

811.4. Growth Rings. Early and Late Wood

See Nos. 3735, 4325.

811.5. Sapwood and Heartwood

See No. 4312.

811.6. Texture, Grain, Figure

See No. 3652.

811.7. Phloem. Bark

See No. 3652.

812. Physical and Mechanical Properties

4396. Goławski, S. Z badań porównawczych fizycznych i mechanicznych własności drewna sosnowego pochodzącego z posuszu. **[Comparative tests of the physical and mechanical properties of Pine wood from dead standing trees.]** *Prace Inst. Tech. Drewna* 1 (2), 1955 (7–41). 1 ref. [Pol.pol.russ.e.] P.R.

Tabulates results of the following tests on specimens cut from 3-m. logs from the central part of the lowest ⅓ of the stem of 9 healthy, living, and 9 dead, 180-year-old Scots Pine: oven-dry density; proportion of late wood; compression strength; shear strength; static bending strength; impact bending strength; tensile strength ∥ and ⊥; toughness (impact m. kg./sq. cm.) hardness and cleavage. The tests were on pieces taken from near the pith, at mid-radius of the heartwood, and in the outer sapwood, and having a moisture content between 11·7 and 16·4%. No practical differences in properties could be detected between the healthy living and dead trees, the only 3 properties in which differences reached significance being: proportion of late wood, shear, and impact bending strength.

4397. Krzysik, F. Fizyczne i mechaniczne własności drewna jodły i dębu szypułkowego. **[Physical and mechanical properties of the woods of *Abies alba* and *Quercus robur*.]** Wydawnictwo Przemysłu Lekkiego i Spożywczego, Warszawa. 1955. pp. 104. 18 refs. [Pol.russ.e.]

Includes the following chapters: (*A*) in the section on Silver Fir: (1) sampling; (2) macroscopic features; (3) microscopic structure; (4) distribution of moisture in the wood; (5) physical and mechanical properties (compression, static bending, impact, hardness, density, correlation between density and resistance, analysis of variability of the properties); (*B*) in the section on Oak: (1) sampling; (2) mean ring width and proportion of late wood; (3) volume shrinkage; (4) density; (5) compression; (6) static bending; (7) impact; (8) dynamic bending; (9) hardness. Nearly all the data are Polish.

812.1. Optical, Acoustic, Frictional, Thermal, and Electrical Properties

See also No. 4486.

4398. Ellis, E. E. **Combustibility vs. fire resistivity.** *For. Prod. J.* 6 (4), 1956 (161).

A glued laminated beam, 9 × 27⅝ in., was tested in an open fire for one hour at an average temperature of 1270° F. (max. 1600°). A centre cut showed an uncharred cross-section of 7¼ × 26 in. (75·8%). There was no trace of delamination. The reduction in section is not considered critical at normal safety factors.

4399. Takechi, O., and Inose, O. **Analysis of the fundamental properties of electric resistance of wood, II. On the electric resistance of wood in relation to the moisture content and the temperature.** *Scientific Reports of the Matsuyama Agricultural College, Matsuyama* No. 10, 1953 (13–35). 7 refs. [E.e.] C.G.B.

Small blocks of *Chamaecyparis obtusa* wood with m.c. between 14 and 21% were tested at temperatures ranging from 10 to 36° C. Resistance decreased with rising temperatures, the decrease being greatest at the lowest m.c.s. The current flowing through the wood tended to decrease the moisture on the anode side and to increase it on the cathode side.

812.2. Behaviour with Liquids and Gases. Moisture Relations etc.

See also Nos. 4412, 4416, 4535.

4400. Begley, C. D., and Jeffers, J. N. R. **Moisture content of fresh-felled hardwoods.** *Rep. For. Res. For. Comm., Lond. 1954/55*, 1956 (112–8).

In the course of investigations into the suitability of home-grown hardwoods for pulping, it was necessary to convert yields of green timber into their oven-dry weight, and data were accordingly required on the moisture content of fresh-felled hardwoods. Certain information was already to hand and this was supplemented by sampling timber from two forests in S.W. England, which also provided figures on the m.c. of stem- and branchwood, and that of wood from trees of different ages. The species investigated were Oak, Beech, Birch, Sweet Chestnut, Ash, Sycamore Maple, Elm, Alder, Willow and Poplar. The work is described by the first author, with a statistical analysis by the second. It reveals the extent of a tree-to-tree variation for different species, and shows this to be a matter of perhaps greater interest than the variation from species to species or variation within the tree.

4401. Ito, M. **[The amount and distribution of water in the stems of Akamatsu (*Pinus densiflora*) and Kuri (*Castanea crenata*) grown at Kurokawa district in Gifu Prefecture.]** *Repr.* from *Science Report of the Faculty of Art and Science, Gifu University, Gifu* No. 3, 1955 (299–307). 17 refs. [Jap.e.] P.R.

Samples used were from trees felled in May, August and November. Mean values for moisture content of heartwood (hw.) and sapwood (sw.) of *P. densiflora* were respectively 47 and 128%, with a maximum of 167% in some sw. samples. In *C. crenata*, values ranged from 96 to 107% with little difference between hw. and sw. In *P. densiflora*, m.c. increased, and in *C. crenata* it decreased, with increasing height in the stem. In *P. densiflora* felled in November, m.c. decreased steadily from outer sw. to pith, and in that felled in August it decreased suddenly near the boundary between the inner sw. and the hw. The m.c. of *P. densiflora* varied considerably during the year and that of both species was least in August. Tangential and radial shrinkage of *P. densiflora* from time of felling to absolute dryness were respectively 7·5 and 3·8%, and of *C. crenata* 9·0 and 6·12%. Sp. gr. of green wood was 0·95 and 0·60 for *P. densiflora* and 0·85 and 0·99 for *C. crenata* in hw. and sw. respectively. A table with English legend shows the volume % of wood substance, water, and air in freshly felled stems at 5 heights between 0·2 and 8·2 m. *From author's summary.*

4402. TACK, C. H. **The moisture content of timber in buildings in Uganda**. *Tech. Note For. Dep. Uganda* No. 9/55, 1955. pp. 2 + 9 gphs.

Monthly weighings were made of samples of 12 species, distributed to several parts of the country. Graphs show the monthly variation in m.c. from Oct. 1953 to Dec. 1954 for *Alstonia boonei* and *Manilkara cuneifolia*, and the average for all species. It is concluded that, for most parts of the country, seasoning to 12–15% m.c. is adequate for most purposes, but that the wide variation in equilibrium moisture content in the north poses special problems.

4403. PECK, E. C. **Moisture content of wood in use**. *Rep. U.S. For. Prod. Lab., Madison* No. 1655 (rev.) 1955. pp. 5 + 2 tbls. + 3 maps. P.R.

Presents data and recommendations to aid the user in selecting the correct moisture content for wood used under various conditions in different parts of the U.S.A. [Cf. *For. Abstr.* 9 (No. 2434).]

4404. BROOKS, E. **Variation throughout the year in moisture content of some wooden building components**. *Timber of Canada* 17 (4), 1956 (23 . . . 26). [Forest Products Laboratory of Canada, Ottawa.]

Tabulates, for 3 buildings, data from all exposures and from interior and exterior positions, showing the year's mean and range of moisture content in various parts of window sashes and frames, doors and studs and in plywood subflooring. No values high enough to support fungi were found. This is doubtless true over the years and probably throughout most of Canada.

4405. ORMAN, H. R. **The response of New Zealand timbers to fluctuations in atmospheric moisture conditions**. *Tech. Pap. For. Res. Inst. N.Z. For. Serv.* No. 8, 1955. pp. 32. 11 refs.

The equilibrium moisture contents (e.m.c.) of some New-Zealand-grown timbers deviate considerably from the generalized e.m.c. graph presented in overseas publications. Of the timbers studied, Rimu sapwood and heartwood have the highest and lowest equilibrium respectively. A method is presented for calculating from known meteorological conditions the e.m.c. of six species, including the heartwood and sapwood for two. By applying the general method of determing e.m.c. to data from some 95 weather stations throughout New Zealand, maps have been drawn showing the mean general e.m.c. for January and July, and the yearly average. In areas of low humidity it has been necessary to develop a formula to adjust the 9 a.m. humidity reading to a more accurate daily mean.

Areas of low e.m.c. are found during the summer months in central Hawke's Bay, Wairarapa, Wairau Valley, central Canterbury, and central Otago. Areas of highest e.m.c. are found during the winter in Northland, central North Island, West Coast of South Island, parts of Southland. Of the principal towns, Alexandra has a general e.m.c. figure of 10% in January; Hokitika a general e.m.c. of over 21% in July. From the wood moisture isopleths drawn on the maps, the e.m.c. for various species in any district in New Zealand can be determined. The moisture-repellent effectiveness of paint coats and their effect on e.m.c. are examined. A good priming coat is almost as effective as three-coat work in preventing moisture movement, but only for the first 3–4 weeks after application.

The degree of response is determined for various species, Rimu sapwood being the most sensitive of the species examined. The effect on e.m.c. of density, thickness, weathering, and heating of timber is discussed. *From author's summary.*

4406. FOUNTAIN, W. C., and GUERNSEY, F. W. **Some variables affecting the shrinkage of Western Hemlock**. *For. Prod. J.* 6 (4), 1956 (148–52). 2 refs. [Forest Products Laboratory, Vancouver.]

A preliminary study made at Vancouver with a dimensional recorder (described and illustrated) giving a continuous record of movement. Charts are presented, showing shrinkage patterns under 3 kiln drying schedules for 1 × 8 × 24-in. test specimens of high and low moisture content, cut from flat-sawn boards. Results are discussed.

4407. HARTMANN-DICK, U. Untersuchungen über die Durchlässigkeit des Holzes bei Druckfiltration. II. Durchlässigkeit für Lösungen verschiedener Art. [**The permeability of wood to fluids under pressure. II. Permeability to solutions of different kinds.**] *Forstwiss. Cbl.* 74 (5/6), 1955 (163–83). Many refs. [G.g.]

Tests were made with: (1) 28 different mineral salts in aqueous solution, (2) acids (HCl and H_2SO_4) and alkalis (NaOH, KOH and NH_4OH), (3) organic compounds in aqueous solution, and (4) organic solvents and solutions of organic substances in them. Most of (1) gave lower permeability values than pure water, though salts of heavy metals and alkali salts promoting pronounced swelling sometimes showed higher values. In the case of cations, and even more markedly in the case of anions, penetration was increasingly retarded with increasing gel-shrinkage properties of the ions, according to Hofmeister's lyotropic series. A deviation was noted, however, in the case of Mg, which consistently gave lower permeability values than Ca and Al. Comparisons of N/10, 1-N and 2-N solutions of the same salts gave, for the cations, decreased permeability with rising concentration. With anions that promote swelling, such as Br and I, maximum permeability values occurred at normal concentrations (1-N). With Al, permeability decreased very markedly with rising concentrations. Group (2), particularly the alkalis, having a strongly inhibiting effect on penetration, following an ionic series corresponding to the lyotropic series. Alkalis at high concentrations reduce permeability by causing swelling and chemical changes in the cell walls. Of group (3), low-molecular carbohydrates have a high penetration rate. High-molecular compounds penetrated only when very dilute and rapidly caused blockage. Changes in concentration occur as the substances pass through the wood—mostly small changes with neutral salts, but more important ones with alkalis and formaldehyde, owing to the formation of chemical combinations. Organic solvents permeate sapwood much more quickly than water. Fat-soluble substances such as paraffin wax, resin, oleic acid and coal tar, in benzene solution, penetrate wood fairly readily if alcohol and benzene are first passed through it. [Cf. *For. Abstr.* 15 (No. 2832).]

812.3. Density. Specific Gravity. Buoyancy

See also No. 4333.

4408. ENČEV, E. A. Vlijanie na vlažnostta vărhu obemnoto teglo na dărvesinata. **[Effect of moisture content on the density of wood.]** *Separate* from *Izvestija na Instituta za Gorata, Otdelenie za Selskostopanski Nauki, Bălgarska Akademija na Naukite, Sofia* No. 1, 1955 (143–54). 15 refs. [Bulg.russ.g.]

Assuming that no internal stresses or plastic deformations occur in passing from oven-dry to maximum m.c. or *vice versa*, the author derives, (*a*) 4 equations for calculating any air-dry or green density from basic or oven-dry density, (*b*) equations for calculating these densities from density values at various m.c.s., and (*c*) equations for the maximum m.c. and maximum density.

4409. YANDLE, D. O. **Statistical evaluation of the effect of age on specific gravity in Loblolly Pine.** *Rep. U.S. For. Prod. Lab., Madison* No. 2049, 1956. pp. 4 + 3 photos + 2 gphs. + 5 tbls. 3 refs. P.R.

Density increases significantly in the radial direction from the pith outward, and the decrease in ring width is insufficient to account for this increase.

4410. GOŁAWSKI, S. Ciężar właściwy i wytrzymałość na ściskanie drewna sosnowego w różnych kierunkach przekroju poprzecznego strzały drzewa. **[Density and compression strength of Pine wood in different directions of the bole cross-section.]** *Sylwan* 99 (5), 1955 (468–76). [Pol.pol.]

Specimens were taken from disks sawn at ⅓ height on 18 Pine trees, ca. 181 years old, of mean d.b.h. 43·7 cm., mean height 29·7 m. For each of the 4 points of the compass, three specimens were taken, from positions near the pith, near the bark, and intermediate. The specimens were first conditioned to a moisture content of 12–18%, and the standard test-pieces then prepared. Determinations of m.c., density, and compression strength were carried out in accordance with the respective Polish standards. No significant differences were found between densities and compression strengths of test-pieces facing different points of the compass.

812.7. Strength Properties

See also Nos. 4310, 4410, 4451, 4474–5.

4411. KRAMER, P. R., and SMITH, R. L. **Strength properties of plantation grown Slash Pine.** *For. Prod. J.* 6 (3), 1956 (129–36).

Investigations on strength of plantation material from eastern Texas and south-western Louisiana showed that this was very variable and generally inferior to that of naturally grown material. Only a limited portion of the variation could be ascribed to the commonly considered variables—number of rings per inch, moisture content, and summer wood %—but the last named appeared to be the best predictive criterion. Location and other determining factors are discussed, and the use of punched-card procedures in the evaluation of the numerous data is described.

4412. MCSWAIN, G., and KITAZAWA, G. **Application of ultrasonic and sonic vibrations for improvement and testing of wood. Final report.** *Teco Project, Timber Engineering Company, Washington* No. *B*-33, 1951. pp. iv + 53. 8 refs. P.R.

The report is divided into 3 sections: (1) the effect of ultrasonics on the treatability of wood, (2) comparison of the effectiveness of ultrasonic vibrations, pressure treatment, and dip treatment for increasing dimensional stability, and (3) non-destructive testing of wood. It was found possible to increase the absorption ratio of small samples of treatable woods by ultrasonic treatment; increased intensity, within certain limits, is conducive to increased absorption. About the same degree of dimensional stability was obtained with dip and ultrasonic treatments when commercial water repellent was used; the ultrasonic gave slightly better results with water/glycol solution. For both solutions, pressure treatment resulted in higher anti-swell efficiency and greater penetration than the other two methods. It has been possible to determine the dynamic modulus of elasticity of standard-size beams by means of a nomogram, using sonic vibrations. Measurements of both longitudinal and transverse vibrations can now be made to determine the stiffness of wood. *From authors' summary.*

4413. SUDDARTH, S. K. **A hydraulic test facility for timber structures.** *For. Prod. J.* 6 (5), 1956 (186–9).

A new structural test unit at the Purdue University Research Laboratory consists of a structural floor slab, steel holding-brackets, and a hydraulic system for applying load forces to full-scale specimens. Its reported advantages include immediate detection of specimen failure, uniform loading, simplified instrumentation, multiple load directions, repeated loads at short intervals, and space economy. *Author's summary.*

4414. ARMSTRONG, F. H. **A laboratory for testing timber structures.** *Wood* 21 (5), 1956 (178–82). 1 ref.

Describes the cable-pulley system developed at Princes Risborough, and now used elsewhere both in the U.K. and abroad for testing structures. Photographs of trusses, box beam, timber and plywood roof or floor units, and circular and portal arches under load, illustrate the method, the procedure of which follows generally the requirements of *British Standard Code of Practice* No. *CP*112.

4415. ZERBE, J. I. **Impact modulus of elasticity in wood: a relationship of impact values to static and dynamic measurements.** *For. Prod. J.* 6 (5), 1956 (205–8). 14 refs.

Beams of *Fagus grandifolia*, *Picea rubens*, and *Aucoumea klaineana* were subjected to dynamic flexural and longitudinal vibration tests, and also a static bending test. There was a fairly close correspondence between the vibration test values for the modulus of elasticity and the static bending test values, but those derived from impact tests, and particularly the standard test, differed considerably. The reasons for these discrepancies are discussed and modification of formulae suggested.

4416. ŁAWNICZAK, M. Wpływ zmian wilgotności drewna na zdolność utrzymywania gwoździ. **[Effect of variations in the moisture content of wood on nail-holding properties.]** *Sylwan* 100*A* (1), 1956 (29–35). 8 refs. [Pol.pol.russ.g.]

Results of tests with Pine showed that: (1) moisture gain in the wood increased the holding power if the wood was nailed when air-dry (ca. 12% m.c.); (2) if nailed at or about fibre-saturation point (ca. 30% m.c.), the subsequent drying substantially reduced the nail-holding power; (3) any marked fluctuation in m.c. substantially reduced nail-holding power.

813. Wood Chemistry

See also Nos. 4552 *et seq.*

4417. Le bois de châtaignier, éléments pour sa revalorisation par la technologie. **[The wood of the Sweet Chestnut, factors promoting its extended industrial use.]** [*Pap.*] *3e Sess. Comm. int. Chât., Rome 1955* No. *FAO/CH* 16-*E*, 1955. pp. 5. 5 refs. [F.] Limited distribution.

Discusses the future of Chestnut in Portugal, including disease, use of Chestnut coppice for planting arid slopes, and industrial uses of wood and bark, and presents a chemical analysis of the wood and bark of 10- to 15-year-old coppice shoots.

813.1. Chief Organic Constituents. Constituents of the Cell Wall

4418. JACQUIOT, C. Nouvelles recherches sur le processus de lignification dans les tissus d'arbres cultivés *in vitro*. **[New investigations on the lignification process in tree tissues cultivated *in vitro*.]** *Bull. Ass. tech. Industr. pap., Paris* 1953 (1), (23–5). 5 refs. [F.] P.A.T.R.A.

[Cf. *For. Abstr.* 14 (No. 3071).] Conventional staining methods and lignin reactions were applied to new tissue in the cambium of *Quercus* sp., *Castanea sativa*, and *Populus tremula*. With the exception of tissues of *C. sativa* grown on media containing aneurine, pantothenic acid, inositol, biotin, and hydrazide of *p*-amino-benzoic acid, stainings with iodine green, phloroglucinol, indole, and the Cross and Bevan reaction were positive, whereas the Mäule reaction and staining with orcin and resorcinol were negative.

4419. TRAYNARD, P., AYROUD, A. M., and EYMERY, A. Existence d'une liaison lignine-hydrates de carbone dans le bois. **[Existence of a lignin-carbohydrate bond in wood.]** *Bull. Ass. tech. Industr. pap., Paris* 1953 (2), (45–52). 29 refs. [F.] P.A.T.R.A.

By using several different methods, the authors succeeded in isolating from (Poplar) wood lignin-carbohydrate complexes that were subsequently split by hydrolysis into their constituents, viz. lignified products and '-oses' (e.g. arabinose, xylose). The nature of the bond is discussed.

4420. TRAYNARD, P. Bases de la chimie de la lignine. **[The bases of the chemistry of lignin.]** *Bull. Ass. tech. Industr. pap., Paris* 1954 (5), (151–9). [F.] P.A.T.R.A.

Discusses the method of chemical decomposition of lignin (elementary analysis, aromatic structure, chain structure, model substances, OCH_3 groups, hydroxyls, carbonyl groups, double bonds, hydrolysis by alkalis, sulphonation), and Freudenberg's biological synthesis method.

4421. GAY, R. Sur la cristallinité de la cellulose. **[On the crystalline nature of cellulose.]** *Bull. Ass. tech. Industr. pap., Paris* 1953 (2), (53–60). [F.] P.A.T.R.A.

Proposes a model of the fine structure of cellulose, involving the existence of chains consisting partly of crystallites interconnected by 'colloidal' bridges, and attempts to explain some properties of fibres by means of this model.

813.2. Minor Organic Constituents. Extractives. Cell Contents

4422. KENNEDY, R. W. **Fungicidal toxicity of certain extraneous components of Douglas-Fir heartwood.** *For. Prod. J.* 6 (2), 1956 (80–4). 25 refs.

Taxifolin was obtained by chemical methods from the butt end of a single co-dominant second-growth tree of *Pseudotsuga taxifolia*. Results of malt/agar and wood-block tests with *Fomes annosus*, *Lentinus lepideus* and *Poria incrassata* are tabulated and graphed. It appears that taxifolin may be largely responsible for the moderate decay resistance of this species.

4423. NATH, B. **Chemical examination of the heartwood of *Melia azadirachta*.** *J. sci. industr. Res., India* 14*B* (12), 1955 (634–6). 8 refs. D.S.I.R.

A colourless crystalline compound, $C_{24}H_{30}O_5$, isolated from the heartwood, has been provisionally named 'nimatone'. *Author's summary.*

813.4. Chemical Effects of Heat. Chemistry of Thermal Decomposition

4424. STAMM, A. J. **Thermal degradation of wood and cellulose.** *Industr. Engng. Chem.* 48 (3), 1956 (413–7). 29 refs. P.R.

Analysis of data obtained by different authors for the weight loss of wood under different heating conditions shows: (1) straight-line relationships between the logarithm of residual weight and the time of heating (oven-heating or under the surface of molten metal) for 6 × 1 × 1-in. test-pieces of Southern Pine, White Pine, Douglas Fir or Sitka Spruce and for Sitka veneer $\frac{1}{16} \times 5 \times 1$ in.; similar relationships are found between the logarithm of residual strength and the time of heating; (2) straight-line relationships between log. K (K being the slope per hour of the straight lines in 1) and the reciprocal of absolute temperature; (3) that the energy of activation has comparable values for different coniferous woods or their components, but that thermal decomposition of hemicellulose is ca. 4 times as rapid as that of wood; (4) straight-line relationships between logarithms of heating time and the temperature required to attain various degrees of degradation of wood.

813.8. Poisonous and Irritant Properties

See No. 3998.

814. Natural Durability. Old Wood. Fossilized Wood

See Nos. 4422, 4504.

815. Effect of Growth Factors on Structure and Properties

See also Nos. 4310, 4333, 4396, 4409–11, 4459, 4545.

4425. PECHMANN, H. VON, and SCHAILE, O. Die Auswirkungen der waldbaulichen Behandlung auf die Holzeigenschaften der Fichte—untersucht am Beispiel einiger oberschwäbischer Fichtenbestände. **[The influence of silvicultural management upon the wood properties of Spruce—illustrated by investigations in some Upper Swabian Spruce stands.]** *Forstwiss. Cbl.* 74 (9/10), 1955 (305–18). 8 refs.

Studies were made on three comparable stands in the Treherz forest district with different histories of management, in order to assess the relative effects of their histories on the production of high-quality, clear timber. The best quality was achieved where regeneration (either natural or artificial) was sufficiently abundant to cause natural pruning, and had taken place under shade, which was removed only gradually. [Cf. *For. Abstr.* 16 (No. 946).]

82. Conversion, Shaping, Assembly and Finishing of Wood: General

4426. Messeheft 1956, Technik und Holzwirtschaft. **[Fair number 1956. Wood industry and technology.]** *Holz-Zbl.* 82 (50), 1956. pp. 160. [G.]

A special number describing and discussing the section for woodworking machinery (including also installations such as drying kilns, steaming pits, and dust removers) shown at the German Industries Fair, Hanover, 1956. Numerous special articles include: New developments in chipboard manufacture (*F. Kollmann*); Modern planing machines (*H. Wacker*); Wood bending in the furniture industry (*F. Fessel*).

4427. VA. Rückschau auf die Deutsche Industriemesse Hannover 1956. **[The German Industries Fair, Hanover, 1956, in retrospect.]** *Holz-Zbl.* 82 (69), 1956 (859 . . . 872). [G.]

Includes illustrations and descriptions of saws, moulders, sanders, combined tools, maintenance equipment, veneer cutters, glue spreaders, presses, kilns and fans, electrical hand tools, glues etc. of improved or novel construction or specification.

4428. Hartmetallwerkzeuge für die Holzbearbeitung. **[Hard-metal [carbide] tools for woodworking.]** *Holz-Zbl.* 82 (60), 1956 (747–50). [G.]

Describes existing types and grades, their technical features, optimum cutting speeds etc., suitability to different types of wood material, and the requirements as to stability, etc. of machines to which hard-metal cutting tools may be fitted, and compares performances and costs with those of high-grade steel tools. Some cutters of modern design are illustrated.

4429. KELLEY, T. M. **U.S. Navy experience with carbides applied to woodworking machines.** *For. Prod. J.* 6 (4), 1956 (159–61).

Among the instances of successful use cited is the machining of 150,000 linear feet of Teak for decking without regrinding, as against < 200 with high-speed steel.

822. Saws and Sawing

See also Nos. 4456–61.

4430. ORLICZ, T. Wpływ sprawności mechanicznej traka pionowego na wielkość posuwu. **[The effect of the mechanical efficiency of a vertical frame saw on the feed rate.]** *Sylwan* 99 (1), 1955 (45–9). [Pol.]

It is demonstrated that η, the total mechanical efficiency—(sum of cutting power and feed power)/total power—is not constant, but

$$= 1 - (1 + A)N_1/N$$

where A is ca. 0·10, N_1 is the idle-run power, and N the total power. Since the feed (per revolution) varies roughly as the product ηN, the feed rate will decrease more than N decreases. A nomogram shows the values of η for different values of N and N_1.

4431. HVAMB, G. **Elastic wedges—a new development for sash gang saws.** *For. Prod. J.* 6 (4), 1956 (27*A*–29*A*). 2 refs. Transl. by L. H. Reineke from *Technical Note, Norsk Treteknisk Institutt, Blindern* No. 11, 1955.

Describes a steel wedge, slotted to provide a calculated elasticity, and its application in tightening frame saws. [Cf. *For. Abstr.* 17 (No. 2012).]

4432. **Perforated band saw.** *For. Equipm. Note, FAO* No. *D*.4.55, 1955. pp. 1.

Describes a saw manufactured by Éts.C.D., Puteaux (Seine), France. The blade was designed with holes in it, in order to solve the problem of tensioning. An incidental advantage of the perforated blade is the complete ejection of the sawdust. [Cf. *For. Abstr.* 15 (p. 383).]

4433. **['Forester' band mill.]** *Timb. Tr. J.* 217 (4157), 1956 (94).

Designed for use by unskilled labour and capable of quick erection and operation on forest sites, this horizontal band mill, diesel-, petrol-, or electric-powered, is designed to advance on rails against a stationary log, with manual or automatic feed. Despite its mobility, it is a sturdy unit capable of sawing logs up to 60 in. in diam. with performances up to 40–50 and 50–70 cu. ft./hour for hardwoods and softwoods respectively. Variable forward speeds and standard high speeds for return are incorporated. Advantages include economy in running and maintenance, and relatively low capital cost.

4434. HYLER, J. E. **Modern sawmilling. Parts 42–46.** *Sth. Lumberm.* 192 (2400–2404), 1956 (37 . . 40; 43 . . .52; 33 . . . 38; 51 . . 60; 41 . . . 48).

Bandsaw maintenance.

4435. KRAUS, A. Sägenschärfen mit der richtigen Schleifscheibe. **[The right type of grinding wheel for saws.]** *Holz-Zbl.* 82 (75), 1956 (938–9). [G.]

Discusses advantages and disadvantages of various types, particularly with reference to deterioration through resin-coated sawblades.

823. Planing, Cutting of Mouldings. Chiselling, Mortising and Tenoning. Boring. Turning

See No. 4426.

824. Forms of Joint. Jointing and Assembly

824.1. Nailed Joints

4436. SUDDARTH, S. K., and ANGLETON, H. D. **Nail popping, a result of wood shrinkage.** *Sta. Bull. Ind. agric. Exp. Sta.* No. 633, 1956. pp. 41. 7 refs. [Purdue Wood Research Laboratory, Department of Forestry and Conservation.]

Conclusions drawn from a series of experiments include the following: (1) nail springing is directly proportional to wood shrinkage; (2) longer nails spring more than short ones; (3) shape, surface, and diameter of nails have little or no effect on springing, except that a cement coating on the shank appears to increase the amount of springing; (4) repeated cycles of high and low moisture content in wood have a cumulative effect on the outward movement of nails driven into it. [Cf. *For. Abstr.* 17 (No. 2024).]

824.8. Glues and Gluing

See also Nos. 4371–2, 4450, 4471.

4437. HYLER, J. E. **Glues and gluing. Parts 81–85.** *Sth. Lumberm.* 192 (2400–2404), 1956 (57 . . 60; 57–8; 51 . . 54; 67–8; 59 . . 62).

Panel-on-frame gluing, doors, laminated rails etc.

4438. KNIGHT, R. A. G. **Requirements and properties of adhesives for wood.** *Bull. For. Prod. Res., Lond.* No. 20 (3rd ed.) 1956. pp. 24. 13 refs. Price 2*s*.

Cf. *For. Abstr.* 8 (No. 2522).

4439. MARRA, A. A. **A new method for testing wood adhesives III. Response of the cross-lap specimen to joint defects.** *For. Prod. J.* 6 (4), 1956 (142–8). 3 refs.

When circular areas of different size were prevented from bonding in the interior of the joint, no change in observed strength occurred. When the bonds were prevented from forming at the corners and progressively inwards, the breaking load, though approximately proportional to the bond area, appeared to be more closely related to the length of the bond boundary. [Cf. *For. Abstr.* 17 (No. 3291).] *From author's summary.*

4440. PERKITNY, T., GRZECZYNSKI, T., and ŁAWNICZAK, M. Zagadnienie czasu i temperatury prasowania sklejki kazeinowo-albuminowej. **[The problem of pressing time and temperature in the manufacture of plywood with casein/albumin glue.]** *Przemysł Drzewny, Warszawa* 6 (11; 12), 1955 (301–4; 331–4). 8 refs. [Pol.] P.R.

After an introductory chapter containing an analysis of successive stages of plywood pressing and tabulated data of pressing times and pressing temperatures used in the U.S.S.R. and in Poland, the authors describe tests in these countries: (1) to study the effect of different pressing times and pressing temperatures on the most important properties of Pine and Beech plywoods, using casein/albumin glues and (2) to determine the pressing-time and pressing-temperature ranges within which it is possible to attain the required plywood quality and compensate for a deficiency in temperature by an excess of pressing time or *vice versa*. Three-ply Beech and Scots Pine sheets (90 × 45 cm.) were made of 1·5-mm. veneer with a glue mix consisting of 100 parts (by weight) of casein, 100 parts of albumin, 20 parts of $Ca(OH)_2$ and 1200 parts of water, the glue being applied at the rate of 240 g./sq. m., and 16–17 kg./sq. cm. pressure. The pressing times varied from 1 to 20 min., and pressing temperatures from 30 to 140° C. The following properties were determined: (1) moisture content of plywood immediately after removal from press; (2) shear strength of the glue gline (*a*) after removal from press, (*b*) after 60 days in air at 20° and relative humidity of 98%, and (*c*) after 1 hour in water at 20°; (3) tensile strength of plywood in different directions relative to grain, in conditions (*a*), (*b*) and (*c*). The test-pieces for test (2) were of the Soviet standard type. No clear-cut relationship could be observed between pressing time and temperature on the one hand and plywood properties on the other. It was, however, possible to draw the following conclusions: it is necessary to apply a higher pressing temperature and a longer pressing time with Pine plywood than with Beech, in order to obtain a good glue line; all strength values of Pine plywood pressed below 90° are inadmissibly low; Beech plywood pressed at 60–90° shows relatively high strength indexes; almost all plywood properties begin to deteriorate when pressing time exceeds 14–16 min., particularly at high temperatures.

4441. MURPHEY, W. K., and NEARN, W. T. **Effect of moisture content on the performance and appearance of resorcinol glue lines in laminated Oak lumber.** *For. Prod. J.* 6 (5), 1956 (194–7).

The best bond was produced by gluing at a m.c. of 8%. Within the range of 4 to 22%, shear strengths equalled that of the test species, i.e. solid Red Oak. Delamination tests showed that, for external use, initial m.c.'s should be between 4 and 14%. Depth of penetration and thickness of glue line vary with m.c. With very 'wet' surfaces, the glue loses its identity; with very dry ones, a kind of pre-curing occurs.

4442. MANN, J. W. **How R.F. concerns the wood industry.** *Pap. Amer. Soc. mech. Engrs.* No. 56–*S*-17, 1956. pp. 9. P.R.

Describes the relevant Federal rules and regulations, the various industrial applications and the merits of radio-frequency heating in gluing.

4443. MARRA, G. G. **Development of a method for rapid laminating of lumber without the use of high-frequency heat.** *For. Prod. J.* 6 (3), 1956 (97–104). 3 refs. [Washington State Institute of Technology, Pullman.]

Describes experiments in preheating one surface and spreading the other with a phenol-resorcinol adhesive, which had not proved quite satisfactory, leading to a method with two preheated surfaces both spread with phenol adhesives. Heating on hotplates at 350° F. for 5 min. and pressure for 30 or 60 sec. at 200 lb./sq. in. produced the strongest bonds, provided that assembly time from preheater to press was kept down to 8–12 sec. to prevent premature curing. A fully automatic pilot plant is producing 8-ft.-long 2 × 4's with shear strengths above minimum requirements, from kiln-dried 1 × 4's of Douglas and White Fir [*Abies grandis*?]. Low-quality lumber can thus be used economically to manufacture a product better in quality than its components. Badly warped pieces cannot be used.

4444. MARRA, G. G. **Rapid laminating of lumber without high-frequency heat.** *Bulletin, Washington State Institute of Technology, State College of Washington, Pullman* (*Ser. B*) No. 231, 1956. pp. xi + 32. 2 refs. P.R.

Cf. preceding abstract.

825. Cleaving. Adzing. Mechanical Comminution

4445. **Sawmill refuse chipper.** *Sth. Lumberm.* 192 (2400), 1956 (52).

The chipper's horizontal feed, specially designed for slabs, edgings etc. and not for solid round wood, is controlled by individually hung press-rolls and a synchronized feed-table consisting of several feed rolls. The action of many independent fingers pressing the material tight against the anvil ensures that practically no over-sized chips are produced.

827. Bending. Moulding (other than by Cutting)

See No. 4426.

829.1. Finishing

See also No. 4405.

4446. JOHNSON, E. S. **Finishing development—1955.** *For. Prod. J.* 6 (2), 1955 (72).

A general survey, with chief reference to the U.S.A.

4447. KEATING, W. G., and WILLIAMS, M. A. **Finishing of wooden floors.** *Malay. Forester* 19 (2), 1956 (94–6).

4448. EISENMANN, E. Holzlacktrocknung mit erhöhten Temperaturen. **[Drying wood lacquers at higher temperatures.]** *Holz-Zbl.* 82 (75), 1956 (939 . . . 943). [G.]

Suitable lacquer finishes for furniture can be artificially dried at 60–80° C., provided that a temperature- and moisture-resistant glue, and wood that has been artificially dried to 8–10% m.c. at 60–80°, have been used in their manufacture. Higher seasoning temperatures are apt to lead to surface tensions in the wood.

83. Timber Manufacturing Industries and Products. Uses of Wood as Such

831. Fuelwood and Various Types of Rough Timber

See also Nos. 4370, 4486, 4494, 4498, 4501–3, 4527.

4449. PANĂ, G. I. Lemnul del mină. **[Mine timbers.]** *An. romäno-soviet. Silv.* 9 (3), 1955 (75–87). 9 refs. [Rum.]

Discusses some of the material for the revision of the Rumanian standard for mine timber, compares the Russian and Rumanian standards and includes a table showing physical and mechanical properties of round mine timbers (Spruce) of different lengths for different diameters.

4450. STARKIEWICZ, H., and DYMEK, J. Słupy teletechniczne ze zrzynów tartacznych klejone metodą 'Liktorit'. **[Transmission poles made from sawmill trim, using the 'Liktorit' gluing method.]** *Repr.* from *Przemysl Drzewny, Warszawa* 6 (2), 1955 (63–4). [Pol.] P.R.

The 'Imperkol' method is first described; developed in Poland in 1950, it builds large timber elements by gluing boards in a liquid medium. The boards have longitudinal grooves along the entire length of one face, are coated with glue and assembled [in a form of jig?], and the assembly then immersed in hot creosote which penetrates along the grooves. Besides impregnating the timber, the creosote provides the necessary heat along the glue lines. The 'Liktorit' method is a modification of this method. Results are presented of the first series of trials on the industrial use of this method at the Laboratory of Physical and Chemical Timber Technology at Bydgoszcz in 1953. Sawmill trim was barked, dried to 8–12% m.c. and coated with water-resistant phenol-formaldehyde glue, setting at 140° C. When ca. half the water in the glue had evaporated, the waste was filled into a mould placed in a jig and compressed by means of suitably shaped plungers. The whole jig with the mould under a pressure of 6–12 atm. was immersed in creosote at 160° C. The jig screws must be gradually tightened during the curing process, which lasts ca. 3 hours. The mould used was 280 cm. long. Poles made by the 'Liktorit' method from (*a*) trim alone, (*b*) trim with interspaces filled by thinner waste, (*c*) trim subjected to further trimming so as to yield almost right-angled sections, (*d*) as (*c*) but with interspaces filled with thinner waste, were tested for bending and compression strength, and compared in this respect with solid timber poles (*e*). The figures obtained for (*a*)–(*e*) were: mean bending strength: 170, 255, 644, 376, 701 kg./sq. cm.; compression strength: 387, 374, 442, 364, 319 kg./sq. cm. The (*c*) poles were definitely the best. Further tests concerned the resistance of the glue used to hot and cold water, steam, and hot air; others included long immersion, weather, and graveyard tests. In all cases the subsequent testing of the glue-line strength resulted mainly in cracks being formed in the wood tissue; the few cracks in the glue line developed in (*a*) and (*b*).

4451. STARKIEWICZ, H. Z badań nad wpływem wielkości przekroju poprzecznego zrzynów na własności mechaniczne słupów sklejanych metodą 'Liktorit'. **[Investigations of the effect of the cross-section dimensions of trim on the mechanical properties of 'Liktorit' posts.]** *Sylwan* 99 (6), 1955 (563–7). [Pol.]

No significant differences in bending, compression ∥, and compression ⊥ were found between posts made from 1 × 1, 2 × 2, or 3 × 3-cm. trimming waste. [See preceding abstract.]

4452. NEARN, W. T. **Use of Beech [*Fagus grandifolia*] in rough construction on the farm.** *Beech Utiliz. Ser. Ntheast. For. Exp. Sta.* No. 14, 1956. pp. 6. 3 refs

Discusses the sawing, seasoning, and nailing properties of the wood and its durability, and concludes that with a little care it is very suitable for farm use.

4453. WYMAN, E. P. **Beech for crossties.** *Beech Utiliz. Ser. Ntheast. For. Exp. Sta.* No. 15, 1956. pp. 13. 14 refs.

Concludes that strength properties and resistance to wear of Beech are close to those of Red Oak, the species most frequently used, that with careful handling during logging and seasoning it can be successfully pressure-treated with creosote, and that, if so treated, its durability is good, but that Red Oak supplies are at present too plentiful for Beech to be much used.

832. Mills, Their Functions and Products

832.1. Sawmills and Planing Mills

See also Nos. 4371–2, 4426 *et seq.*, 4546.

4454. MATER, M. H. **Developments in milling—1955 [in the U.S.A. and Canada].** *For. Prod. J.* 6 (2), 1956 (48–50). 57 refs.

Briefly discusses the following subjects: increased lumber production, trends in equipment and methods, wood-residue utilization and research and development. Contains a bibliography of literature on sawmilling.

4455. **New-type conveying system. 'Tangential separator' designed for handling chips, sawdust etc.** *Sth. Lumberm.* 192 (2400), 1956 (46).

Describes an improved device for pneumatic conveying, adapted from the tobacco industry, which can separate material down to 30 μ.

4456. **Gang saws successfully used by Victorian sawmillers.** *Aust. Timb. J.* 22 (2), 1956 (138 . . . 156).

An illustrated account of the logging and milling operations of the Saxton Timber and Trading Company of Victoria, with production statistics and costs. The company operates one of the three Swedish-type gangsaws being used in Australia for milling hardwoods—a Czech 'Kovo', 34-in., high-speed machine. Of the 12 Eucalypts named, *E. delegatensis* forms 90% of the stock of the cutting area. Logs average 60–70 ft. by 30 in. diameter.

4457. TELFORD, C. J. **Small sawmill operator's handbook.** *Agric. Handb. U.S. Dep. Agric.* No. 27, 1952. pp. 121.

Deals mainly with the types and variations of equipment available, installation of equipment, and operational techniques, especially for mills of the circular head-saw type.

4458. NELSON, L. A. **Trimming for maximum values in the Douglas Fir region.** *Timberman* 57 (7), 1956 (84, 86).

Gives tables for the guidance of sawyers, showing the relative values of different grades and lengths and the amount of trim allowable for different grades in cutting down a length of lower grade to produce a shorter piece of lumber in a higher grade.

4459. KOTOK, E. S. **Lumber recovery at a Ponderosa Pine sawmill in the Black Hills.** *Sta. Pap. Rocky Mt. For. Range Exp. Sta.* No. 19, 1956. pp. 9.

A study was made at a typical S. Dakota mill in 1954 to evaluate the effect of various factors on overrun and grade recovery. It was found impossible to correlate overrun and d.b.h. because of differences in local volume tables and the variation in lumber recovery from trees of equal diameter. Regression analyses showed no measurable effect on overrun from differences in site (limestone or non-limestone), log length, log position or apparent log grade. A significant correlation was found, however, between gross log volume and lumber tally. Increasing log and tree diameters gave increasing % of select grades. Increasing amounts of rot gave an increase in the % of select-grade lumber since rot in this species almost always affects the knotty core. Lumber from the non-limestone site was 16·3% and that from the limestone site 9·1% select grade. Butt logs yielded almost 3 times as much select lumber as second logs and 10 times as much as top logs. An attempt was made to differentiate further log grades; more data are needed. After seasoning there was a drop of 20% in select grades from the limestone and of 18% from the non-limestone site.

4460. Matson, E. E. **Lumber grades from old-growth Douglas-Fir sawmill logs.** *Res. Note Pacif. Nthwest. For. Range Exp. Sta.* No. 125, 1956. pp. 6.

Results of an analysis of data from 1575 logs are given in graphs and tables showing recovery by grades in % of net log scale from No. 2 and No. 3 sawmill logs.

4461. **Portable one-piece mill.** *Sth. Lumberm.* 192 (2401), 1956 (54).

Describes and illustrates the Canadian Bachmobile. It measures 31 × 9½ ft., is mounted on 4 tyred wheels, equipped with a 60-in. circular saw and a 200- or 250-h.p. diesel engine. It includes in a single unit conveyor, sawdust blower and a 5- or 6-in. edger. It is available in a manual and a fully automatic model. Capacity is stated as 30,000 ft./day, using average logs of 12 in. diam. and over, with a crew of 5.

832.2. Veneer and Plywood Mills, including the Manufacture of Composite-Wood Assemblies

See also Nos. 4372, 4398, 4437 *et seq.*, 4475, 4484 4506–7, 4551, 4577.

4462. Maleszewski, S. Zwiększenie wykorzystania i zasobów bazy krajowego surowca okleinowego. **[How to increase the utilization and amount of Polish-grown veneer logs.]** *Sylwan* 100*B* (2), 1956 (6–13). [Pol.]

The author recommends: (1) increasing the available volume of veneer logs by cutting the stems at the root collar, thus adding the butt swelling which, in many species, yields figured (particularly sliced) veneer; this can be done so long as coppice is not wanted; (2) introducing additional species capable of yielding figured veneer into stands, and exotic veneer species into groves and parks under State control.

4463. Kwiatkiewicz, M. Zagadnienie przerobu surowca bukowego na sklejkę. **[Utilization of Beech in plywood manufacture.]** *Prace Inst. Tech. Drewna* 2 (2), 1955 (59–103 + 1 tbl.). 8 refs. [Pol.pol.russ.e.] P.R.

Polish Beech is a valuable raw material, the volume yield of plywood per log being ca. 40%. In connexion with checks and splits, both in peeler logs and in veneer sheets, new investigations are suggested for remedying the former, and patching of splits in veneer by veneer wedges, using special wedge shears of Polish design (described and illustrated).

4464. Niox, F. Une intéressante usine de déroulage et de contreplaqué: 'Plexafric'. **['Plexafric', an interesting veneer and plywood factory.]** *Bois. For. Trop.* No. 46, 1956 (41–7). [F.]

Gives an account of the lay-out and equipment of a plywood factory built in 1947 near Pointe-Noire (French Equatorial Africa). The species principally used are *Terminalia superba*, *Pterygopodium* [*Oxystigma*] *oxyphyllum*, *Khaya ivorensis*, and *Entandrophragma cylindricum*.

4465. Feihl, O. **Rotary cutting of curly Yellow Birch.** *Repr.* from *Canadian Woodworker* [*Toronto*] May/June, 1955. pp. [6].

Tests at the Ottawa Forest Products Laboratory showed that satisfactory veneer could be produced by rotary cutting when the bolts were at a uniform temperature of ≮ 150° F. during cutting; raised fibres were numerous on all veneer cut at lower temperatures. Heating at a given temperature for 24 hours before cutting did not produce veneer superior to that cut immediately the required uniform temperature had been reached. Logs conditioned at 200° for 24 hours had a reddish tinge. Veneer from logs heated to 200° or 175° and then cooled below 150° showed raised fibres. The time required to heat logs to various temperatures is shown in a table. The following conclusions were drawn from tests on lathe settings: (1) Good-quality veneer $\geqslant \frac{1}{16}$ in. thick could not be produced. (2) With veneer $\frac{1}{28}$ in. thick, quality increased with increasing bevel in the range 17° 40′ to 21° 00′; a 20° 00′ bevel was adopted as giving good veneer quality without excessively rapid blunting or damage. (3) The optimum knife angle decreased steadily from 90° 00′ at 21 in. bolt diameter to 80° 30′ at 9 in. diameter. (4) Optimum vertical and horizontal pressure-bar openings ranged from 0·035 to 0·009 in. and from 0·010 to 0·001 in. respectively for veneer thickness ranging from $\frac{1}{24}$ to $\frac{1}{100}$ in. (5) Pressure bars with bevels of 22° and 30° scratched the veneer; best quality was obtained from a bar ground at 10°, and only a slightly lower quality from one ground at 14°. A table is given showing optimum lathe settings and temperatures for different veneer thicknesses. The number of raised fibres increased rapidly with thickness in $\frac{1}{24}$- and $\frac{1}{20}$-in. veneers. Trials in a commercial plywood mill showed that production of high-quality veneer was less easy than in the Laboratory, mainly because of variations in pressure-bar setting in the larger commercial lathes, caused by heating of metal parts. However, major defects were sanded off, and a high proportion of grade-A and grade-1 plywood was obtained. Panels faced with veneer glued loose side out could be sanded smoother than those with faces tight side out.

4466. Kauman, W. G., Gottstein, J. W., and Lantican, D. **The mechanical drying of 'Ash' Eucalypt veneers.** *Aust. J. appl. Sci.* 7 (1), 1956 (69–97 + 2 photos). 6 refs. P.R.

Rotary-peeled, $\frac{1}{16}$-in. veneer from 5 trees of *Eucalyptus gigantea* was dried in a multiple-daylight platen press by the breathing method. Platen temperature and dwell (closed) time were the most significant variables. The quality of the dried veneer improved with increase in temperature. At 240° F., best results were obtained with 15 sec. dwell time and at 280° and 320° with ca. 3 sec. Small opening of the platens during breathing periods gave better results than wide opening. A theoretical explanation is proposed to account for the incidence and severity of degrade under various conditions. Using specially developed methods, cross-circulation kilns and a mechanical roller drier yielded better veneer than platen drying. *From authors' summary.*

4467. Gottstein, J. W., and McCombe, B. **Recent studies on [seasoning] 'Ash' type hardwoods.**

Collapse intensified by heating while green. *For. Prod. News Lett. C.S.I.R.O. Aust.* No. 216, 1956 (1–2).

Pilot tests on *Eucalyptus gigantea* and *E. obliqua* show that temperature and heating time should be as low as is compatible with good peeling; the former should not exceed 110° F. When sawn green, this type of timber must be dried before heating. It is not safe to recondition until 'core' moisture is < 30%.

4468. ENGLESSON, T. Virkesutnyttjningen vid plywoodproduktion. **[Yields in plywood manufacture.]** *Pap. ja Puu* 38 (3), 1956 (89–95). 2 refs. [Sw.e.] P.R.

Gives tables showing yields (mean results from 3 mills) at different stages in manufacture. About 18% of the volume is lost during rotary cutting, 7·2% from shrinkage, 5·5% from trimming, and 6·5% from sanding. Average yield is about 43% of the total log volume. These figures are compared with some from Germany [see *For. Abstr.* 16 (No. 3461)].

4469. **Laminated timber.** European Productivity Agency, Organization for European Economic Co-operation, Paris. 1956. pp. 129. 42 refs.

A report, with conclusions and recommendations, of a Technical Assistance Mission after a visit to firms and institutions in the U.S.A. The most important field studied was the manufacture of structural laminated members. Methods used at 4 representative mills, techniques, and factors affecting design are described and discussed.

4470. **The technique of laminating.** *Wood* 21 (5), 1956 (174–7). 1 ref.

A brief report on *Project, Organisatian for European Economic Co-operation* No. 113 with illustrations borrowed from it. An itemized bill of the capital cost, for U.K. conditions, of a 30,000 sq. ft. factory, producing 50 cu. ft./hour shows equipment at £14,590 and buildings at £70,000. A kiln would be additional.

4471. KETCHUM, V. **Glued laminated timber construction.** *Pap. Amer. Soc. mech. Engrs.* No. 56—*S*–15, 1956. pp. 22. 22 refs. P.R.

A description of principles of design involved in laminated timber construction, thickness of laminations, nailed arches and frames, RF gluing, scarf joints, adhesives, technical control, protection, treatments, durability of glue lines, fire resistance, and other relevant subjects.

833. Timber in Buildings and Engineering Structures (Manufacture and Use)

See also Nos. 4499–500.

833.1. Building Components and Fittings: General

See also Nos. 4413–4, 4469–71, 4534.

4472. **The use of wood in construction.** *Rep. Stheast. For. Exp. Sta. 1955*, 1956 (55–8).

Describes and illustrates the resistance of various materials to hurricane Ione. Creosoted piling proved the best foundation in beach areas. Diagonal wood sheathing covered with weatherboarding proved most resistant for walls. Fibreboard was not strong enough. Wood shingles stood up well, both as wall and roof coverings.

4473. **Housing development in Indonesia.** *Unasylva* 10 (1), 1956 (2–6). 2 refs.

Gives some account of the preservative treatment and methods of construction used in building with Bamboo.

4474. KOVACSOVICS, K. Wirtschaftliche Ausnutzung der Festigkeitseigenschaften des Holzes durch Verwendung von Rundträgern an Stelle von scharfkantigen im konstruktiven Holzbau. **[Economical timber use, based on a consideration of strength properties, by substituting [part-] round beams for square-sawn ones in timber construction.]** *Allg. Forstztg.* 64 (21/22), 1953 (272–5). 3 refs. [G.g.]

A comparison of the moments of resistance, bearing strength etc. between beams of varying cross-sections and with varying amounts of wane, taking into account the greater strength of outer fibres and the advantage of leaving them intact, and a computation of the savings in timber (particularly by the use of smaller dimensions) made possible by such substitution in simple constructions, bridges, etc.

4475. JOHNSON, J. W. **Lateral tests on full-scale lumber- and plywood-sheathed roof diaphragms.** *Pap. Amer. Soc. mech. Engrs.* No. 56—*S*–16, 1956. pp. 14 + 18 photos, drawings + 1 dgm. + 4 gphs. + 1 tbl. 10 refs. P.R.

A summary of tests on full-scale roof diaphragms at the Oregon Laboratory from 1952 to 1955. Diaphragms tested were: (1) longitudinally lumber-sheathed; (2) diagonally lumber-sheathed, with various construction variables; (3) diagonally lumber-sheathed with different length/width ratios; and (4) plywood-sheathed. [Cf. *For. Abstr.* 17 (Nos 2070, 3339.]

4476. BURGESS, H. J. **Malayan timbers for flooring.** *Malay. Forester* 19 (2), 1956 (90–3). 3 refs.

Gives tabulated data on pore size and density for timbers included in the Malayan Grading Rules, and notes on the suitability of 22 species for use in flooring.

833.4. Special Uses in Agricultural Structures

See Nos. 4452, 4496.

834. Shingles. Cooperage. Packing Containers. (Manufacture and Use)

See also Nos. 4365, 4497, 4651.

4477. **Wood stave pipes.** *Aust. Timb. J.* 22 (1), 1956 (4, 7–8).

Contains an account of the manufacture, by the Australian Wood Pipe Co. Ltd., Sydney, of pipes from 2 to 240 in. in diam., capable of withstanding pressures up to 225 lb./sq. in. These pipes have been installed in rugged country liable to winter snow, and carry water without freezing. Other advantages over metal pipes are enumerated. The species used are *Eucalyptus gigantea*, *E. obliqua*, *Syncarpia laurifolia* and Douglas Fir. Applications include hydro-electric and other water supplies, water-borne sewerage, chemical fluid and fuel disposal, and water storage.

4478. TARANSAUD, R. Les merrains dans la tonnellerie française. **[Stave-wood in French cooperage.]** *Rev. int. Bois* 23 (216), 1956 (103). [F.]

A short account of the special requirements of the cognac industry. The spirit has to mature in the wood, and only well-grown Oak from the Limousin or the Forêt de Tronçais is used. The method of preparing staves is described.

4479. GALLWITZ, K., and HÜLST, H.v. Untersuchungen an Pflanzenschutz-Brühbehältern aus Holz. **[Tests on wooden containers for liquids used in plant-protection.]** *Landtechnische Forschung, München* 4 (3), 1954 (91–4). [G.] SIL.

Test pieces of Oak, Beech and Spruce were immersed in Raphatox (a DNC preparation) at 0·5 and 5% concentration, each for 1 and for 7 days, and, after washing and air drying, left in distilled water, constantly agitated, for 7 days. The amount of Raphatox present in the water was found to depend on the concentration used, the duration of contact, and the duration of elution. It was greatest for Beech and smallest for Oak, but in all cases it was potentially dangerous to plants. Next, 5 protective coatings [unspecified] were applied and tested with 11 chemicals of the types most commonly used for spraying. Of these, one paint, and 2 lacquers [one used with a filler, but no compositions given] prevented all absorption, and were resistant to bending and impact; 2 were failures.

4480. THOMPSON, C. O. **Wooden boxes and crates.** *For. Prod. J.* 6 (4), 1956 (21*A*–24*A*).

Discusses species, grades, and dimensions used, developments in nailing and re-sawing equipment, standardization, preservative treatments, and changes in uses.

4481. KRUGER, K. W. **Developments in packaging in 1955 [in the U.S.A.]** *For. Prod. J.* 6 (2), 1956 (67–9). Many refs.

A general survey, containing a bibliography of references on packaging.

4482. SARDO, W. H. **Pallets fastest growing user of lumber.** *Sth. Lumberm.* 191 (2393), 1955 (173–5).

A description and classification of pallets by design and construction.

835. Industrial and Domestic (Utility) Woodware. Toys and Models. Sports and Recreational Goods. Musical, Scientific and Mathematical Instruments. Surgical Applications etc.

4483. ISHAQ, S. M. **Exploitation of Baluchistan Juniper (*Juniperus macropoda*) for the pencil industry.** *Pakistan J. For.* 5 (4), 1955 (250–63 + 8 photos).

Gives data on the areas of forest available, method of exploitation (hand felling and cross-cutting, and transport by donkey and mule), royalties, methods of ensuring regeneration, qualities of the wood and requirements for pencil manufacture.

4484. BOOTH, H. E., and HUMPHREYS, F. R. **Construction notes on laminated skis.** *Tech. Notes For. Comm. (Div. Wood Technol.) N.S.W.* 9 (1/4), 1956 (10–4). 1 ref.

Recommends *Eucalyptus maculata* or *E. saligna* for the top and bottom laminae, and *Pinus radiata*, *Doryphora sassafras* or *Araucaria cunninghamii* for the core. The process of manufacture is given in detail. [Cf. *For. Abstr.* 13 (No. 1607).]

836. Furniture and Cabinet-Making. Carving. Marquetry. Wooden Ornaments

See Nos. 4366, 4371–2, 4426, 4571.

839.8. Industrial Waste Wood, its Processing and Uses

See also Nos. 3902, 4445, 4450–1, 4454–5, 4554–5, 4572–3, 4577.

4485. FELDMAN, E. S. **Air pollution control and the forest products industries.** *For. Prod. J.* 6 (2), 1956 (27*A*–30*A*). 22 refs.

Discusses the various ways in which forest products industries contribute to air pollution through methods of incineration of wood wastes and manufacturing processes. Indicates means to reduce such pollution, including the development of new uses for wood waste. *From author's summary.*

4486. WINKELMANN, H. **Wood burning.** *For. Occ. Pap. FAO* No. 1, 1955. pp. 48 + 12 gphs. + 19 dgms. Limited distribution.

Contains chapters on: wood as a fuel (calorific value, combustion, heat loss etc.); the technique of wood combustion; and wood stoves used for heating and cooking in various countries.

4487. VORREITER, L. **Fundamental properties of sawdust.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 2794, 1955. pp. 9 + 1 photo + 3 gphs. Transl. by M. Slade from *Holz-Zbl.* 79 (105), 1953 (1127–8). [See *For. Abstr.* 15 (No. 4213).] Limited distribution.

4488. CORDER, S. E., MORRIS, C. O., and ATHERTON, G. H. **Suspension drying of sawdust.** *Pap. Amer. Soc. mech. Engrs.* No. 56—*S*–18, 1956. pp. 5 + 2 photos. + 1 dgm. + 5 gphs. 6 refs. P.R.

Presents the results at Oregon Laboratory on the effects of rates of air flow and sawdust feed, initial gas temperature and sawdust moisture, and sawdust particle size, on the operation of an experimental suspension-drying system for sawdust. Suspension drying was found to be a practical and efficient method of drying.

4489. FOSLIE, M. Noen tall for fastmasse- og fuktighetsinnhold i forskjellig sagbruksavfall. **[Some figures for solid volume and moisture content in different sawmill wastes.]** *Teknisk Småskrift, Norsk Treteknisk Institutt, Blindern* No. 13, 1956. pp. 4. [Nor.] P.R.

Tabulated figures show moisture content (% of dry and of total weight), solid volume %, weight solid and loose (kg./cu.m.), and weight of dry matter (kg./cu.m. loose) for dry or green slabs and edgings, different conditions of chips and sawdust, and pressed bark from floated timber.

84. Preservation and Other Treatments to Improve the Properties of Wood. Damage by Biological Agencies and its Control. Seasoning. Timberyard Practice

841. Wood Preservation

See also Nos. 4371–2, 4412, 4450–1, 4473, 4511.

4490. **Grading, classification and preservation of timber.** *N.Z. Timb. J.* 2 (5), 1955 (42 . . . 45). 5 refs.

Traces the development and organization in New Zealand of standards for grading and specification of indigenous and exotic hardwoods, and for codes of practice in kiln drying, preservation and use in buildings.

4491. STUBBS, J. H. **Preservation of wood.** *Malay. Forester* 19 (2), 1956 (72–89 + 8 photos). 17 refs.

A short guide to the preservation of wood with special emphasis on the need for preservation and facilities available in Malaya.

4492. HATFIELD, I. **Advances in the field of wood preservation in the United States in 1954–55.** *For. Prod. J.* 6 (2), 1956 (59–62). 16 refs.

Summarizes the progress made. Discusses the increased use of preservative-treated wood, new products and techniques, special research projects, new uses for treated wood, and the activities of the wood-preserving associations.

4493. GROENOU, B. VAN. **Timber impregnated with creosote is not a fire risk.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 2795, 1956. pp. 5. 11 refs. Transl. by M. Slade from *Holzschwelle* 1955 (17), (13–20). Limited distribution.

Concludes from a study of the literature that impregnation affords some protection against fire.

4494. **Preservative treatment of sleepers.** *Rep. (Res. Educ.) For. Dep. Ceylon 1955*, 1956 (16).

Experimental treatment of 77 sleepers of *Eucalyptus pilularis* and 60 of *E. microcorys* showed that neither species took up any creosote. Even under pressures of 200 lb./sq. in. for 3 hours, penetration was no more than might have been achieved by a single brush coat. After one year's service, *E. pilularis* sleepers showed slight cracks, and *E. microcorys* was badly cracked and all signs of creosoting had vanished.

4495. SCHULZ, G. **Exploratory tests to increase preservative penetration in Spruce and Aspen by mold infection.** *For. Prod. J.* 6 (2), 1956 (77–80). 4 refs.

In tests employing both soaking and pressure treatments, both absorption and penetration of an [unspecified] oil preservative solution were usually 3–5 times as great in heavily mould-infected wood as in mould-free or slightly infected wood.

4496. SCHOLLES, W. Holzschutz im Gartenbau. Beitrag zur Frage geeigneter pflanzenunschädlicher Holzschutzmittel. **[Wood preservation in horticulture. Suitable preservatives harmless to plants.]** *Anz. Schädlingsk.* 29 (6), 1956 (87–90). 4 refs. [G.]

Experiments were made with 4 different types of preservative to test their toxicity to plants in both liquid and vapour form. *Begonia semperflorens* was used as a test plant with the following substances: (1) a normal Wolman salt, (2) a highly soluble Wolman salt containing KF, KHF_2 and $K_2Cr_2O_7$, (3) a preservative based on a neutral alkali fluoride and Na pentachlorophenate, and (4) a compound based on a metal silicofluoride specially developed for horticultural uses. Slight damage from vapour was sustained with (1) and (2), and severe damage with (3). Only with (4), where the production of hydrofluosilicates was avoided [formula not given], was no damage inflicted.

4497. **Treatments help protect ammunition boxes.** *Rep. Sth. For. Exp. Sta. 1954* [1955] (49).

A 3-min. dip in preservatives plus water-repellents kept boxes reasonably dry for 18 months at Gulfport, Mississippi, but failed to prevent heavy moisture absorption in the wet jungle of Panama. Water solutions of Na pentachlorophenate gave better protection than the same concentrations of PCP in oil, particularly against stain and moulds, and wax emulsions added to the water gave good water-repellent properties to the boxes so treated. Tests with a new type of wire-bound box made of rotary-cut hardwood veneers showed that it absorbed more protective oil solution in a 1-second immersion than the old type of Pinewood box did in 3 minutes.

4498. MEYER, F. J., and GOOCH, R. M. **The effect of the oil carrier on the performance of pentachlorophenol-treated wood in ground contact exposure.** *For. Prod. J.* 6 (3), 1956 (117–21).

Tests with pressure-treated stakes of Southern Yellow Pine sapwoods indicated that, in general, effectiveness increases as the distillation range of the oil is raised, very heavy solvents surpassing the high-residue creosote used as control. No. 400 fuel oil was an exception, presumably owing to insufficient penetration due to high viscosity. Aromatic content did not appear to be significant. Results are tabulated and analyses of the oils given. [Cf. *For. Abstr.* 12 (No. 1373); 16 (No. 4681).]

4499. HARROW, K. M. **Diffusion impregnation of building timber with boron compounds (part I). Momentary immersion treatment of timber with boron compounds (part II).** *N.Z. Timb. J.* 2 (4; 4), 1955 (28–9; 38 . . . 41, 43). [Plant Diseases Division, Department of Scientific and Industrial Research, Auckland.]

Part I covers general considerations [cf. *For. Abstr.* 14 (Nos. 2781–2)]. Part II shows graphically the advisability of accepting a molecular ratio of 1 : 4 in the mixture of $Na_2O : B_2O_3$ required to get a high and stable concentration of B compounds in water. Control of solution concentration is maintained by hygrometer readings against a temperature-concentration chart, the aim of the process being to maintain, in the surface film applied to the momentarily dipped green timber, a concentration that will allow deposition in the timber of H_3BO_3

equivalent approximately to 1% of the oven-dry weight of the timber. The merits of treating timber as individual pieces and in tight packages are detailed and summarized in favour of the latter, which retain ca. 50% more solution, probably owing to less complete draining. Schedules are given, based on 1-in. timber, for the concentrations required, by density class (Radiata Pine, Rimu, Matai and Tawa) and diffusion storage time (size and species).

4500. BECKER, G. **Experience and developments in the field of wood preservation in building.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 2734, 1955. pp. 18 + 5. 22 refs. Transl. by H. E. Kijlstra from *Deutscher Zimmermeister, Karlsruhe* 1954 (18), (1–8). Limited distribution.

Discusses the nature of the problem, German regulations, preservatives and methods of application, with special reference to conditions and practice in Germany.

4501. WALTERS, C. S., and MEEK, W. L. **Effect of soaking position on treatability of Pine fence posts.** *For. Sci.* 2 (1), 1956 (43–53). 8 refs.

A detailed statistical comparison, believed to be the first, of the results of treating full-size posts of peeled, air-seasoned *Pinus echinata*, cold-soaked for 24 hours in a fuel-oil solution of PCP, (*a*) standing vertically, butts down, and (*b*) lying horizontally in 5 layers. In (*a*) mean solution absorption was 5·21 lb./cu. ft. against 4·37 for (*b*), and 88% of the sapwood of (*a*) against 65% of (*b*) was impregnated. Mean toxicant concentration in (*a*), greatest in the butt section, decreased upwards, while the reverse was true of (*b*). The (*a*) result, due to hydrostatic pressure, gives greater protection near the ground line and is thus considered to lead to a longer service life.

4502. WALTERS, C. S. **Vertical treatment of posts superior to horizontal treatment.** *For. Note Ill. agric. Exp. Sta.* No. 68, 1956. pp. 2.

Comparison of Shortleaf Pine fence posts cold-soaked for 24 hours in a fuel-oil solution of PCP showed that those treated full length, butts down, in a vertical position, absorbed an average of 5·21 lb./cu. ft. compared with 4·37 lb. for those treated in a horizontal position, with better distribution of the preservative. [Cf. preceding abstract.]

4503. HICOCK, H. W., and OLSON, A. R. **Highway post survey: a 1956 progress report.** *Circ. Conn. agric. Exp. Sta.* No. 196, 1956. pp. 12.

Reports on a service test of wooden posts used in highway fencing, begun in 1940. Best results were given by pressure-creosoted Red and Southern Yellow Pine posts. Pressure-treated hardwood posts were much less satisfactory.

4504. SHIE, T. C. **[Experiment on the natural decay of timbers (1).]** *Bull. Taiwan For. Res. Inst.* No. 32, 1952. pp. 8 + 3 tbls. 7 refs. [Chin.chin.]

Test specimens (2 × 2 × 20 cm.) of 6 common Formosan species—*Tsuga chinensis* (all sapwood), *Chamaecyparis taiwanensis* (all heartwood), *Schima superba* (some s.w., some h.w., some both), *Beilschmiedia erythrophloia* (both), *Machilus zuihoensis* (both), *Ormosia formosana* (some s.w., some h.w.)—were oven-dried, exposed for 48 hours, then immersed in (*a*) creosote or (*b*) blue camphor oil at 27° C. for 24 hours. They were then dried for 5 days and put out in a poor sandy soil, one batch of each half buried horizontally, the other stuck in vertically for ⅓ of their length, for 15 months, along with controls. Results, tabulated in detail with English translations of the headings, show that *T. chinensis* and *C. taiwanensis* decayed least whether treated or not, and *M. zuihoensis* most. Of the 7 references, 3 are Chinese and 4 Japanese.

842. Treatments to Improve the Resistance of Wood to Physical and Chemical Agencies other than Fire

See also No. 4412.

4505. STAMM, A. J. **Dimensional stabilization of wood with carbowaxes.** *For. Prod. J.* 6 (5), 1956 (201–4). 18 refs.

Specimens of Sitka Spruce were soaked in water (controls), and in 25% (by weight) aqueous solutions of glycerine and of carbowaxes (polyethylene glycols) before drying by successive stages to oven-dryness. With carbowaxes of molecular weights between 200 and 600, almost complete stability was obtained, with higher molecular weights, and with glycerine, somewhat less. Weight increase due to deposition of carbowax averaged 50%. Carbowaxes can be easily leached, but it was possible to fix them with an equal weight of phenolic resin. The treatment, however, is likely to cause gluing and finishing difficulties.

4506. WNUK, M. Dobór surowca i warunki prasowania lignofolu. **[Selection of raw material for, and the pressing conditions of, Lignofol [improved wood].]** *Prace Inst. Tech. Drewna* 2 (2), 1955 (3–58). 13 refs. [Pol.pol.russ.e.] P.R.

Lignofol is defined as improved wood obtained by compressing a numbers of veneers each < 1 mm. thick, using thermo-setting synthetic resin glues and > 40 kg./sq. cm. pressure. The conventional improved wood in the form of sheets of different dimensions, is obtained by using veneers of suitable size; these can be arranged in various ways in relation to each other: (1) with all veneers laid with the grain parallel, parallel-grain (PG) Lignofol is obtained, suitable for guide members, aircraft propellers, motor cars, railway carriages, shuttles, bobbins, electric insulators etc.; (2) with the veneers cross-banded throughout, cross-band (CB) Lignofol, suitable for sheet-metal moulding, for machine base-plates, insulating plates, vats resistant to chemicals etc.; (3) 'star-banded' (SB) Lignofol, obtained by arranging the consecutive veneers with their grain direction always differing by the same angle, usually 45°, finds a wide application in the manufacture of rollers, V-groove pulleys, silent gears, friction couplings, water-pump gaskets, bushings etc.; finally (4) if PG Lignofol includes (every 3rd or more veneer sheet) one veneer sheet with grain ⊥ to the prevalent direction, reinforced parallel-grain (RPG) Lignofol is obtained, used for the same purposes as PG but where a higher cleavage and compression ⊥

are required. Besides these 4 types of Lignofol, the author mentions 'snip' (S) Lignofol obtained by moulding narrow cuttings (snips) of veneer with a suitable glue.

The author also presents the results of his own investigations and of those by a team of workers of the Laboratory of Physical and Chemical Technology of Timber, Institute of Timber Technology. Since Beech is plentiful in Poland, only Beech veneer was used for making test-pieces of Lignofol, the thickness chosen being 0·5 mm.; the glue was an aqueous solution of the phenol-formaldehyde resin 'Alpit', setting at 140° C. Static bending, compression and shear strengths were determined. It was found that Lignofol can be manufactured from raw material of a lower grade than that specified in the Polish plywood standard PN D-95010; a higher yield of good veneer is obtained when curved peeler logs of standard length are halved in length before peeling; it also appears that veneer with knots or knot-holes up to 5 cm. diam. might be used in a certain proportion in Lignofol manufacture without lowering its quality, although further research in this field is necessary. Lignofol made from 0·53-mm. Beech veneer was found to compress by 32–42% for 50 kg. and 49–54% for 100 kg./sq. cm.; this degree of compression was found to be independent of both the arrangement of veneers and the pressing time. The mechanical strength of Lignofol was the same whether the veneers used were whole sheets or made up from smaller ones. Temperatures in the central glue line were determined during pressing and found to be much lower (e.g. by 40° C.) than the temperature of the press platens, without, however, causing loss of strength in the inner layers. Central glue-line temperature was independent of the arrangement of the veneers and of the pressure used (50 and 100 kg./sq. cm.). The relationship between the ultimate thickness of Lignofol sheets and the pressing time is graphed, and data of temperature in the central glue line and of shear strength are presented in tables. Pressing time rises from 30 to 195 min. as thickness increases from 3 to 12 cm. In order to release stresses developed during compression, Lignofol sheet may be cooled by circulating cold water round all 4 sides, a method found to minimize both checks and variations in thickness.

Lignofol S was found to have high mechanical strength if cuttings < 1·5 mm. thick and > 25 mm. long were compressed at 100 kg./sq. cm. for 30 min. to produce 25 × 25 × 3-cm. test pieces. The mechanical properties did not change when up to 50% of Beech was replaced by Pine.

Veneer waste can also be utilized for making moulded Lignofol > 70 mm. thick in special moulds with lateral heating [cf. *For. Abstr.* 17 (No. 4577)].

4507. Wnuk, M., and Sobczak, J. Prasowanie lignofolu maszynowego przy użyciu form. **[Mould pressing of Lignofol [improved wood] for the manufacture of machine parts.]** *Repr.* from *Przemysl Drzewny*, *Warszawa* 6 (10), 1955 (289–90). [Pol.] P.R.

Discusses tests at the Polish Institute of Wood Technology, Poznań, for the purpose of reducing the time of compressing Lignofol blocks up to 12 cm. thick. In the heated hydraulic presses, conventionally used, with a platen temperature of 140° C., the innermost glue line takes 5 hours to reach 100°. In order to reduce this time, a method has been devised which reduces heat losses along the edges and substitutes heating along the fibres for the conventional heating across the grain, thus increasing conductivity. Thin veneer cut to a tight fit is put with adhesive into cylindrical steam-jacketed moulds and then compressed by plunger. In tables and a graph it is shown that (1) this method reduces pressing time considerably, particularly for greater thicknesses of material; (2) shear strength is much higher than that of products obtained by conventional pressing, as is the 'quality index' (viz. shear strength/thickness × pressing-time). These results were obtained even when the diameter/thickness ratio of the final Lignofol blocks exceeded 1·8 (the ratio of temperature conductivities along and across the grain).

843. Fireproofing and Fire Resistance

See No. 4493.

844. Attack by Plant Organisms

4508. **List of publications relating to fungus defects in forest products and to decay in trees.** *Rep. U.S. For. Prod. Lab., Madison* No. 508, 1955. pp. 27.

Covers the period since 1920 and lists, for U.S. authors only, papers, articles and some books on: fungus defects in forest products and their control; natural decay resistance of wood; effect of fungi on strength of wood; physiology of wood-attacking fungi; evaluation of protective chemicals; special techniques in products pathology; chemistry of decay, and cull and deterioration (living and killed trees).

844.1. Sap-staining and Mould Fungi

See also Nos. 4007, 4101–2, 4495.

4509. Westhuizen, G. C. A. van der. **Three species of *Curvularia* from *Pinus* [*patula* in South Africa].** *Bothalia* 6 (3), 1956 (501–5). 8 refs.

Descriptions of *C. maculans* and *C. brachyspora*, both found on shoots of *P. patula* infected with *Diplodia pinea*, and of a fungus at present considered to fall under *C. pallescens*, found in bluestained sapwood of *P. patula* and proved by inoculation and re-isolation in culture to cause bluestain.

4510. Glaser, T., Spława-Neyman, S., and Stolarski, P. Z badań nad czynnikami powodującymi kawowo-brunatne przebarwienie sosnowego drewna tartacznego. **[Investigations on the cause of the coffee-brown discoloration of converted Scots Pine timber.]** *Sylwan* 100 *A* (1), 1956 (94–6). 2 refs. [Pol.]

Research at the Polish Institute of Timber Technology, Poznań, showed that this discoloration was caused by *Discula brunneo-tingens* (fungus imperfectus), which can be found in R. I. Meier's Key for identification of wood-staining fungi, Moscow, 1953.

4511. Eades, H. W. **Sap stain and mould prevention on British Columbia softwoods.** *Bull. For. Br. Can.* No. 116, 1956. pp. 40. 22 refs.

Tests of dip treatments with a number of chemicals showed that (1) Na tetrachlorophenate and Na 2-chlororthophenylphenate, (2) PCP (Na salt), (3) PCP (Na salt) and borax, (4) Na tetrachlorophenate, and (5) ethyl mercury phosphate and PCP (Na salt) were efficacious in preventing sapstain and mould on rough lumber and that (3) and (5) were also suitable for treating box shooks.

844.2. Wood-destroying Fungi

See also Nos. 4067, 4089–96, 4127, 4227, 4422, 4504.

4512. Russell, P. **A selective medium for the isolation of basidiomycetes.** *Nature, Lond.* 177 (4518), 1956 (1038–9). 2 refs. [Bowaters Development and Research Ltd., Central Research Laboratories, Northfleet, Kent.]

In the course of a programme of work involving the isolation of wood-rotting fungi from infected Scandinavian wood-pulp, considerable trouble was experienced with rapidly spreading moulds, particularly *Trichoderma viride* [cf. *For. Abstr.* 17 (No. 2211)]. Experiments have shown that *T. viride* isolated from wood-pulp is able to retard, and in some cases prevent, the growth in artificial culture of various basidiomycetes. This difficulty has now been largely overcome by the development of a selective medium containing 0·006% *o*-phenyl phenol. In general, the micro-fungi appear to be much more sensitive to this chemical than the basidiomycetes normally encountered in this work. The only wood-rotting fungus so far observed that failed to grow on the medium was *Merulius lacrymans*.

4513. Shimazono, H. **Oxalic acid decarboxylase, a new enzyme from the mycelium of wood destroying fungi.** *Journal of Biochemistry, Tokyo* 42 (3), 1955 (321–40). 16 refs. [E.e.] L.S.

A soluble enzyme responsible for decomposition of the acid was isolated from the mycelium of *Coriolus* [*Polystictus*] *hirsutus* and *Collybia velutipes* (white-rot fungi). Brown-rot fungi were unable to decompose the acid. *From author's summary.*

4514. Scurti, J. C. Sulla degradazione dei legni delle piante forestali e da frutto per azione dell' *Armillaria mellea*. **[The decay of wood of forest and fruit trees caused by *A. mellea*.]** *Ann. Sper. agr.* (*n.s.*) 10 (2), 1956 (495–512). 35 refs. [It.it.e.] C.G.B.

A study was made of the effect of *A. mellea* on the wood of a number of species. It was found to destroy mainly cellulose and the hemicelluloses. Cellulose was heavily attacked in *Fagus sylvatica*, *Morus alba*, *Picea abies* and *Juglans regia*, much less in *Prunus avium*, *Pyrus malus* and *Castanea sativa*, very little in *Robinia pseudocacia* and *Populus alba*, and not at all in *Prunus persica*. Destruction of hemicelluloses was usually parallel to that of cellulose. Lignin was damaged little or not at all, in all species. The examinations were made after 6 or 12 months of culture. Another set of experiments *in vitro*, on lignin with added nutrient solutions, confirmed that lignin is not destroyed by the fungus. As regards the utilization of carbohydrates and N by *A. mellea*, it was found that glucose is readily taken up, but not the agar ester phosphates; ammonia N is greatly utilized, nitrate N less, and urea N not at all. *From author's summary.*

4515. Alaçam, R. Ayancık Orman Işletmesinde Kayın tomruğunun ardaklanmasına karşı alınan tedbirler ve çalışmalar. **[Measures to control decay of Beech logs in Ayancık Forest District, and relevant studies.]** *Istanbul Üniv. Orm. Fak. Derg.* 5*B* (1), 1955 (48–68 + 1 tbl.). [Turk.turk.]

The large areas of Beech forest in the Black Sea region are now producing 25–30 thousand cu.m. of sawlogs annually, for milling at Ayancık. Felling takes place in spring and summer, the logs remain a long time in the forest, and it is estimated that, in the past 9 years, 31,500 cu.m. of timber, valued at over £(Turk.) 7 million, have been lost through decay. In summer 1954, 2900 cu.m. of logs were kept under artificial rain for 3 months, which saved 95%. Recent felling in autumn and extraction during the winter have also reduced decay losses. A plan of the Ayancık sawmill is appended.

4516. Kišpatić, J. Pokusi zaštite bukovih trupaca od 'prešlosti' (crvenila, zagušenosti, piravosti). **[Attempts to protect Beech logs against incipient deterioration and decay.]** *Šum. List* 79 (3/4), 1955 (69–85). 9 refs. [Croat.croat.g.]

Replicated tests with the preservatives 'Bayer-Buchenschutz' and 'Basiment' [see *For. Abstr.* 13 (No. 3428)] in 3 different localities in Croatia on 38 Beech logs (and 20 controls) have shown that both preservatives provide good protection against decay.

845. Attack by Animals

845.1. Marine Borers

4517. Daniel, A., and Srinivasan, V. V. **Occurrence of two wood-boring pholads at Madras.** *Curr. Sci.* 25 (2), 1956 (59–60). 6 refs. A.P.B.

Martesia fragilis was collected from catamarans and fishing boats from the open sea, but was not found inside the harbour, where *M. striata* abounds. A description of *M. fragilis* is presented, with points of difference from *M. striata*.

845.2. Terrestrial Borers

See also Nos. 3609, 4007, 4134, 4218.

4518. Rose, D. J. W. **Powder-post and other wood borer beetles which are pests of timber in Rhodesia.** *Rhod. agric. J.* 53 (2), 1956 (218–34). 7 refs. E.M.B.

Notes on some lyctid, bostrychid, cerambycid and anobiid beetles, and on pinhole borers, with recommendations for control and protection.

4519. Smith, R. H. **The rearing of *Lyctus planicollis* and the preparation of wood for control tests.** *J. econ. Ent.* 49 (1), 1956 (127–9). [Southeastern Forest Experiment Station.]

Winter-cut pieces of Oak or Hickory 1–3 in. in diam., are cut into 10- to 12-in. lengths, split lengthwise to 0·75 in. thick and dried to < 18% m.c. On each piece are put 6♂ and 6♀ (parasite-free) adults, and the pieces stacked in a breeding container. With plentiful starch, ca. 30% emergence occurs in 4 months, the rest in 9–12 months. Freshly seasoned pieces of wood placed on the stack will attract emerging adults, which can then be easily collected.

4520. **Spray treatment for prevention of *Lyctus* attack in sawn logs.** *Leafl. For. Prod. Res., Lond.* No. 43 (rev.) 1956. pp. 3.

4521. EDWARDS, D. W., HADLINGTON, P., and MCGREGOR, G. M. **The fumigation of a house with methyl bromide.** *Tech. Notes For. Comm.* (*Div. Wood Technol.*) *N.S.W.* 9 (1/4), 1956 (6–9). 4 refs.

A large house, mainly of Baltic Pine, badly infested with *Anobium* and termites, was covered with plastic sheets and subjected to 1–2 lb. MeBr/1000 cu. ft. for 9 hours. Insect-infested samples of *Eucalyptus* and 6 cultures of fungi were exposed at the same time. All *Lyctus* and *Anobium* in timber (up to 2 in. thick) were killed. Of the fungi only *Merulius lacrymans* was killed and that probably by heat.

4522. BECKER, G. **Investigations on the suitability of contact insecticides for wood preservation.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 2732, 1955. pp. 11. 8 refs. Transl. by H. E. Kijlstra from *Holz Roh- u. Werkstoff* 11 (2), 1953 (45–50). [See *For. Abstr.* 15 (No. 1981).] P.R.

4523. NAUDE, T. J. **Union of South Africa, Department of Agriculture. Annual report of the Secretary for Agriculture for the year ended 31st August, 1955. Entomology.** *Fmg. S. Afr.* 31 (359), 1956 (88–92). E.M.B.

Among other projects, experiments are in progress on (1) the long-term toxicity of wood preservatives; (2) environmental requirements of *Hylotrupes bajulus* and *Cryptotermes brevis*; (3) protection of Eucalypt logs against borer attack; (4) prevention of emergence of beetles from imported logs; (5) tests of the toxicity of preservatives by introducing larvae of *H. bajulus* into artificially bored holes; (6) heating of planks before dipping to obtain good penetration of preservatives; (7) effects of temperature and humidity on egg incubation of *Nudaurelia* sp.; and (8) control of the Wattle bagworm [*Acanthopsyche junodi*], in which a new insecticide, endrin, has achieved remarkable results, 2 oz. in 3 gal. dieselene/acre giving 99·5% kill of 4th- and 5th-instar larvae [cf. *For. Abstr.* 16 (No. 3189)].

4524. MCMULLAN, D. L. **Ambrosia beetles and their control in British Columbia.** *For. Chron.* 32 (1), 1956 (31–43). 8 refs.

Gives a general account of ambrosia beetles, the type and extent of damage, and research in methods of control, and describes in some detail experiments made by B.C. Forest Products Ltd., in protecting logs in the forest by spraying with a formulation consisting of 4 lb. 36% γBHC, 1·6 gal. Velsicol Ar-50, 0·15 gal. Antarox A-400, and 34 gal. water, which gave promising results.

4525. **Protecting stored Pine pulpwood from bark beetles.** *Rep. Sth. For. Exp. Sta. 1955* [1956] (55–7).

In investigations into the problems of bark-beetle control in mill yards, such as high rate of initial infestation which makes prevention of beetle-induced decay impossible and prevention of spread nearly so, handling difficulties, and fire hazards of oil solutions, the dipping of bolts into a solution of 1–2 lb. of BHC in 50 gal. of No. 2 fuel oil, or of a heavy-oil distillate with a high flash point, gave > 98% control. Water emulsions (of about double strength) were inferior, but the few beetles that penetrated treated bark seldom produced broods. Solutions and emulsions of isodrin or endrin (2 lb./50 gal. oil or water) were disappointing. Dips were superior to sprays, owing to the latters' poor distribution in the interior of piles. Storage in concentration yards where wood could be stacked so as to make spraying effective is suggested as a possible solution.

845.3. Termites

See also Nos. 4521, 4523.

4526. BENITO MARTINEZ, J. Los termitos en España—biología, daños y métodos para combatirlos. **[Termites in Spain—biology, damage inflicted and methods of control.]** *Montes, Madrid* 12 (68), 1956 (102–17). 35 refs. [Span.]

Termite species encountered in Spain are *Reticulitermes lucifugus*, *R. lucifugus*, var. *santonensis*, *Calotermes flavicollis* and *C. dispar*. Information is presented on their biology, the damage they inflict and on their control. A list is included of chemicals used for soil disinfestation, giving formulae, concentrations, dosages and manufacturers.

846. Steaming

See No. 4426.

847. Drying (Seasoning)

See also Nos. 4008, 4370, 4372, 4402, 4426–7, 4466–7, 4490.

4527. ORMAN, H. R. **Air-drying of New Zealand grown Corsican Pine natural round fence posts.** *N.Z. For. Res. Note* No. 4, 1955. pp. 20. 3 refs.

Natural round posts of Corsican Pine (*Pinus nigra* var. *calabrica*) were cut and stacked in the several seasons of the year, in order to study rates of drying in the open and under a roof. Drying was generally unsatisfactory except in roofed stacks erected in the winter, spring, and autumn at Hammer Springs, and in the spring and summer at Waipa State Sawmill. Degrade, due to the fungi *Peniophora gigantea*, *Stereum sanguinolentum*, and *Schizophyllum commune*, is rapid in Corsican Pine posts seasoned in unroofed stacks: a reduction in toughness strength of up to 44% can be expected in posts during seasoning in such stacks. *From author's summary.*

4528. PECK, E. C., KOTOK, E. S., and MUELLER, L. A. **Air drying of Ponderosa Pine lumber in Arizona.** *For. Prod. J.* 6 (2), 1956 (88–96).

Presents, in graphs and tables, the results of an investigation on the air-drying of *Pinus ponderosa*. The data include: the periods required to air-dry 4/4 and 8/4 common and 6/4 shop grades down to 10%

m.c.; losses in grade and value during air drying and planing; and losses caused by not roofing the piles. *From authors' summary.*

4529. Smith, H. H. **Improved utilization of Western hardwoods by modern drying.** *For. Prod. J.* 6 (3), 1956 (121–4). 14 refs.

Describes uses and resources (estimated at 23,000 million bd. ft. for the more important species) and discusses both air and kiln drying. Species mentioned are *Alnus rubra, Acer macrophyllum, Fraxinus latifolia, Populus trichocarpa, Lithocarpus densiflorus Umbellularia californica* and *Quercus kelloggii.* [Cf. *For. Abstr.* 14 (No. 2837).]

4530. **Seasoning methods studied for Incense-Cedar planks.** *Rep. Calif. For. Range Exp. Sta. 1955* [1956] (33–4).

Sapwood and light heartwood of *Libocedrus decurrens* could be kiln-dried readily even when green. 'Sinker-type' heartwood is slow to dry and prone to degrade during kiln-drying; it must be sorted out, if freshly sawn timber is to be kiln-dried without preliminary air drying. This is difficult, because sapwood and sinker-type heartwood are contiguous or closely associated in the standing tree and because streaks of sinker-type wood may extend through easily dried light stock. Squares seasoned faster and with less checking, by air drying, than planks. The spacing between piles may have little influence on drying rate during the summer but a significant influence during the poorer drying weather in winter.

4531. Rehman, M. A. **The seasoning behaviour of Indian timbers. Part III. (Kiln drying schedules and seasoning peculiarities of some Indian woods.)** *Indian For.* 82 (5), 1956 (252–9).

Gives 7 schedules with a list of a further 65 species to which they are applicable, and notes on peculiarly refractory species. [Cf. *For. Abstr.* 15 (No. 874).]

4532. Karlsen, O. Er kunstig tørking av trelast lønnsomt sammenliknet med lufttørking? **[Is kiln-drying more profitable than air-drying?]** *Teknisk Småskrift, Norsk Treteknisk Institutt, Blindern* No. 12, 1956. pp. 16. [Nor.] P.R.

Comparative costs for air drying (including stacking, roofing, loss of interest during the drying period of ca. 1 year, and fire insurance) and kiln drying (including depreciation, fuel, maintenance, and fire insurance) are estimated at Kr.113·45 and 129·70 respectively. No definite conclusions can be drawn.

4533. Stevens, W. C. **Timber drying in Scandinavia. A survey of timber seasoning methods employed in Norway, Sweden and Finland.** *Timb. Tr. J.* 217 (4155), 1956 (81–2).

The falling off in quality of Scandinavian timber is not due, as is thought by British importers, to the severity of the schedules used, which are surprisingly mild ($\ngtr$ 50° C.), but probably to smaller timber (more cup- and heart-shake). The mild treatment is designed to prevent darkening the timber and loosening knots, points now to be investigated at Princes Risborough where more severe schedules are in use.

4534. Engelmann, A. Probleme der Holztrocknung in der Parkettindustrie. **[Drying problems in the manufacture of parquet flooring.]** *Holz-Zbl.* 82 (68), 1956 (840). [G.]

Reports on experiments into the degree of uniformity of moisture content obtainable, showing that air-stream velocity and total drying time have hardly any, and drying temperatures little, influence on the result, which is chiefly influenced by the range of initial m.c. of the wood being dried and on the subsequent conditioning process. The latter should take at least 24 to 48 hours and needs careful controlling. The need for accurate measuring methods is stressed.

4535. Sergovskiĭ, P. S. **Wood temperature during kiln drying and importance of the temperature gradient in the wood for process calculations.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 2711, 1955. pp. 6 + 6 gphs. 4 refs. Transl. by M. Slade from *Derev. lesohim. Prom.* 2 (3), 1953 (6–8). Limited distribution. P.R.

In the usual conditions of the kiln-drying process, the moisture-content (m.c.) gradient drives the moisture to the wood surface; the temperature gradient in the wood appears to have an opposite effect, but so far it has not been quantitatively determined. The author discusses views on this subject contained in books by 3 Soviet authors, and quotes the formula (of B. A. Posnov)

$$t_{surf} = t - \Delta t\,(W_{surf} - W_p)/(W_{\mathrm{TH}} - W_p)$$

where t_{surf} is the surface temperature of wood; t = air temperature; Δt = difference between wet- and dry-bulb temperatures; W_{surf} = m.c. on the wood surface; W_p = equilibrium m.c., and W_{TH} = m.c. at fibre-saturation point; Posnov believes that, as long as $W_{surf} \geqslant W_{\mathrm{TH}}$, the value of t_{surf} is equal to the wet-bulb temperature. The author's relevant experiments with laterally well insulated Pine, Beech and Oak test-pieces, gave results agreeing with the following dimensionless relationship: $(W_{surf} - W_p)/(W_{\mathrm{TH}} - W_p) = F(t - t_{surf})/\Delta t$, where F is a constant. In all tests the wood surface m.c. dropped immediately at the beginning of drying below W_{TH} and the rate of drying was never constant. The temperature difference $(t - t_{surf})$ decreased from 3–4° at the beginning to ca. 0·5° C. at the end of drying. The temperature difference between wood surface and core decreased at the same time from ca. 0·5° to almost zero, and so can be disregarded.

4536. Egner, K. **The high temperature drying of timber.** [*Transl. For. Res. Inst. N.Z. For. Serv.*] [1956?]. pp. 11 + 35 photos, dgms. & gphs. Transl. from *Holz-Zbl.* 78 (50/51), 1952. [Cf. *For. Abstr.* 13 (No. 764.] Limited distribution.

4537. Folomin, A. I. **Rapid high temperature timber drying in non-aqueous fluids.** *Wood* 21 (6), 1956 (220–4). 4 refs.

An English version of a Russian article [see *For. Abstr.* 17 (No. 2177)] with formulae and graphs illustrating the process, drawings of the installation, with a description of its operation, and drying schedules for softwoods and hardwoods.

4538. **[Seasoning of timber in toluene vapour.]** *Sylwan* 99 (5), 1955 (401–32). [Pol.]

The articles 'Wood drying by distillation. Theoretical principles and practical application' (*H. Bahr* and *H. Bahr*) and 'Remarks on the rapid method of timber drying by means of toluene' (*A. Waligóra*) discuss the physico-chemical principles and aspects of this method, and its merits. Four other reports were also presented at the special conference held at Tarnow (Poland) on May 26–27, 1955. Results obtained from industrial experience at the Tarnow Timber Plants showed that both coniferous and broadleaved (Beech and Oak excepted) square stock can be dried satisfactorily by this method. Beech with initial moisture content > 40% showed case-hardening and inner checks. Oak was not tested.

4539. WINKEL, L. D. **Casehardening stress relief of Ponderosa Pine.** *For. Prod. J.* 6 (3), 1956 (124–8). 8 refs.

Tabulates results of experiments with steam conditioning, showing that times can be considerably reduced by increasing the amount of steam (not always economical), by first cooling the lumber, or by injecting water into the steam spray with desuperheating devices, 3 of which are illustrated. Reversing the air stream in the kiln gave greater uniformity.

848. Timberyard Practice. Handling and Storage of Timber

See also No. 4515.

4540. THOMAS, A. V. **The storage of home-grown logs in water.** *Scot. For.* 10 (2), 1956 (94–5 + 2 photos).

Briefly describes the successful storage of some 692,000 cu. ft. of logs (mostly Scots Pine) in 3 Scottish lochs after the gale of January 1953. Logs stored in water for as long as 2½ years were free from fungal and insect attack. They are reported to be slightly more difficult to saw than freshly felled timber.

4541. **Mechanical handling equipment.** *Wood* 21 (6), 1956 (254–6).

Brief descriptions, with illustrations, of a hammerhead crane used in New Zealand, a crane fork, a timber sling, 3 heavy-duty fork-lifts, a platform truck, equipment for working at heights (the 'Skyworker Tree King' developed in the U.S.A. and the 'Leroy' retractable mast), an overhead track with hoist, and a mobile crane.

4542. S., H. Neuzeitliche Mobilkrane in der Holzwirtschaft. **[Modern mobile cranes in the wood industry.]** *Holz-Zbl.* 82 (69), 1956 (849–50). [G.]

A discussion of the advantages and drawbacks of different designs.

4543. Der 'HolzKuli'—ein neues Transportmittel für den Sägewerksbetrieb. **[The 'timber coolie', a new transport tool for sawmills.]** *Holz-Zbl.* 82 (38/39), 1956 (508). [G.]

Describes a sturdy 2-wheeled, rubber-tyred push-cart-like steel frame equipped with gripping tongs of a special, self-tensioning construction, by the help of which one worker can pick up and transport whole logs. These are kept balanced by a movable support. With the help of suitable attachments, sawn timber, edgings etc., can also be loaded on the frame.

85. Grading of Wood and Wood Products

See also Nos. 4371, 4425.

852. Detection, Recognition and Assessment of Injuries and Defects

See also Nos. 4050, 4127.

4544. Coeur noir du peuplier. **[Black heart in Poplar.]** [*Pap.*] *8th Sess. int. Poplar Comm. Madrid 1955* No. *FAO/CIP/78-C*, 1955. pp. 2. [F.] Limited distribution.

A report of the Belgian Poplar Commission on the results of their enquiry. Most users of Poplar wood do not consider black heart worthy of attention, but the Union Allumettière considers it a serious defect, resulting either in matches and match boxes of inferior quality or, by avoiding it, an unsatisfactory output per unit of timber [cf. *For. Abstr.* 17 (No. 991)].

4545. **The relation of gelatinous fibres to internal stresses in Hickory.** *Rep. Stheast. For. Exp. Sta. 1955*, 1956 (52).

Tests on samples cut from 30 splitting and 30 non-splitting logs showed the proportion of such fibres to be significantly higher in the former.

4546. YRJÖNEN, E. **Tracing metal bodies in logs and sawmill waste.** *Finnish Paper and Timber, Helsinki* 7 (2), 1956 (25, 27–8). [E.]

Gives further particulars of amounts and types of metal bodies found and the savings made by using a detector. [Cf. *For. Abstr.* 16 (No. 4733).]

4547. BUGLAJ, B. W. Ein neues Prüfgerät für Holzoberflächen. **[A new instrument for testing [the smoothness of] wood surfaces.]** *Holzindustrie, Leipzig* 6 (10), 1953 (295–9). [G.] From *abstr.* in *Prace Inst. Tech. Drewna* 1 (2), 1955 (88). [Pol.] P.R.

Describes a new instrument, based on oblique illumination, that can measure unevennesses in the range 20 μ–2·5 mm.

853. Grading of Wood in the Rough

See also No. 4659.

4548. **Grading rules for hardwood logs (for logs, other than Teak logs, produced by countries of South East Asia and the Pacific, excepting Australia, New Zealand and Japan).** FAO, Rome. [1956?]. pp. 16.

A final draft for critical review. [Cf. *For. Abstr.* 17 (No. 2194).]

854. Grading of Converted Timber

See also Nos. 4458–60, 4490, 4659.

4549. LATHAM, B. **North American softwood grading rules. Part I.** *Emp. For. Rev.* 35 (1), 1956 (42–55).

Outlines the history of grading rules in the U.S.A. and Canada, and discusses in some detail the 3 systems at present in force on the Pacific Coast.

4550. BOISFONTAINE, A. S. **All-purpose Southern Pine lumber. All-purpose grades: who benefits and how. New Southern Pine rules provide merchandising aid.** *Sth. Lumberm.* 192 (2398–2400), 1956 (30; 37; 61).

Gives a summary of the main innovations in the Southern Pine grading rules coming into force on 1st June 1956, dealing in particular with the newly introduced all-purpose stress grades in all sizes, and their uses.

4551. BUGGE, J. **New suggested grading rules for green veneer.** *Lumberm.* 83 (4), 1956 (138).

Shows in tabular form the defects permissible in 4 proposed grades.

86. Pulp Industries. Composite Materials made Wholly or Partly of Woody Matter. Chemical Utilization of Wood

See also Nos. 4371–2.

4552. LOCKE, E. G. **Review of chemical utilization.** *For. Prod. J.* 6 (2), 1956 (63–6). 86 refs.

Discusses, in particular, recent developments in the pulp and paper industry, and reports on wood-residue utilization, research in extractives, increased demand for charcoal, utilization of spent sulphite liquors, and developments in lignin chemistry. *From author's summary.*

861. Pulp and Paper Manufacture. Textile and Other Cellulose Derivatives

See also Nos. 3834, 3992, 4291–2, 4370, 4649.

4553. TROITZSCH, H. Sur le dosage de la lignine dans les pâtes blanches. **[Quantitative determination of lignin in bleached pulps.]** *Bull. Ass. tech. Industr. pap., Paris* 1954 (4), (134–40). [F.] P.A.T.R.A.

A new method based on the complete oxidation of lignin (to CO_2 and H_2O) has been developed for determining lignin present in very small quantities in the bleached pulps. Reproducibility and accuracy of results are claimed to be fair.

4554. JENKINS, J. H. **Progress in the utilisation of sawmill waste for pulpwood.** *Pulp Paper Mag. Can.* 57 (5), 1956 (136–8).

Covers recent developments in the U.S.A., British Columbia, and Eastern Canada; the work of the research committee working under the aegis of the Forest Products Laboratory of Canada (mainly on bark removal, chippers, handling and transport of mill waste and chips); pulp chip standards; and future developments.

4555. GEDNEY, D. R., and CORDER, S. E. **Residues basis for pulp industry expansion.** *Timberman* 57 (6), 1956 (74–5, 78).

Tabulates and discusses the results of a joint survey by the Pacific Northwest Forest and Range Experiment Station and the Oregon Forest Products Laboratory, on the amounts of sawmill waste, especially coarse residues (slabs, edgings and trim) available from 3 counties in W. Oregon by (1) species (Hemlock, Spruce and the true Firs) suitable for sulphite pulp and (2) other species, mainly Douglas Fir, suitable for sulphate pulp and fibreboards. Concludes that the amount is, and will probably remain, sufficient to make possible an increase in pulp production.

4556. STEMSRUD, F. Industriell bruk av lauvtrevirke og tynningsvirke. **[The industrial use of hardwoods and thinnings.]** *Norsk Skogbr.* 2 (5; 6), 1956 (159–62; 191–4). [Nor.]

Discusses the possible use of such wood in Norway for fuel, pulp or boards, with particular reference to German experience in making chip and fibreboards from different species.

4557. LEE, R. S. Importance de l'eucalyptus en tant que matière première dans l'industrie papetière australienne. **[Significance of Eucalypts as raw material in the Australian paper industry.]** *Bull. Ass. tech. Industr. pap., Paris* 1953 (5), (132–7). [F.] P.A.T.R.A.

Outlines the developments leading to the use of indigenous broadleaved species for paper-making, and describes the organization of the industry, the main *Eucalyptus* species used, properties of the pulps, and the general trend of research.

4558. SEABRA, L. DE. Utilização tecnológica dos eucaliptos. Informação sobre o valor papeleiro da espécie *Eucalyptus citriodora* Hook. **[Utilization of Eucalypts. Information on the paper-making value of *E. citriodora*.]** *Repr.* from *Garcia de Orta, Lisboa* 3 (4), 1956 (471–504 + 2 plates). 11 refs. [Port.f.]

Presents the results of experiments with *E. citriodora* from Dondo, Mozambique, made at the request of a cement firm, to explore the possibilities of local material for manufacturing cement bags. Data are presented on the anatomical and chemical properties of the wood, and on the properties of pulp made by the chemical and semichemical processes. By the sulphate or the semichemical Na sulphate processes, paper can be produced that has a bursting and tensile strength superior to those of Swedish packing papers, but is greatly inferior in folding and tearing strength. The author concludes that wood of *E. citriodora* grown in this region is not suitable for paper pulps.

4559. BERTHIER, R. Procédé de cuisson du bois de pin maritime en présence de polysulfures de sodium. **[Cooking *Pinus pinaster* wood in the presence of Na polysulphides.]** *Bull. Ass. tech. Industr. pap., Paris* 1953 (4), (93–106). 7 refs. [F.] P.A.T.R.A.

Results of investigations, presented in tables and graphs, show that a higher yield of pulp and/or better pulp is obtained by 'sulphate' cooking in which polysulphides are substituted for Na_2S than by the conventional sulphate method.

4560. BRISSAUD, L., and RONSSIN, S. Étude de la chimie du bois et des pâtes par la nitration. **[An investigation into the chemistry of wood and into**

pulping by nitration.] *Bull. Ass. tech. Industr. pap., Paris* 1953 (4), (107–17). 13 refs. [F.f.] P.A.T.R.A.

Reviews a series of investigations by various authors since 1937 [including papers abstracted in *For. Abstr.* 3 (p. 221); 6 (p. 28); 14 (No. 1525)] on nitration of wood, and describes nitration experiments by the authors, using a bath of $HNO_3/CH_3COOH/(CH_3CO)_2O$. General conclusions derived from all investigations studied are: (1) nitro compounds in the wood have solubility properties different from those of the same compounds in isolated state, but this difference gradually diminishes as lignin is eliminated by oxidation; (2) a large % of N in nitrated wood appears as nitric ester, but a considerable % appears as a nitro group; (3) the acetone-soluble nitrocellulose obtained by the authors has, after delignification of the wood, a high degree of polymerization.

4561. VELZ, C. J. **Forecasts of stream conditions for pollution abatement and new mill location.** *Pulp Paper Mag. Can.* 57 (5), 1956 (121–3). 5 refs. [School of Public Health, University of Michigan.]

Covers rational use of streams, their self-purification and its appraisal, sources of pollution, hydrological questions, forecasting, and effects of dams, reservoirs, canals etc.

4562. GEHM, H. W. **Technical aspects of waste treatment problems in the pulp and paper industry.** *Pulp Paper Mag. Can.* 57 (5), 1956 (152–7). [National Council for Stream Improvement, Inc.]

Notwithstanding rapidly increasing production, stream pollution is declining in the U.S.A., but no mill practises sewage purification methods and only 10% of the liquor is dealt with in by-products recovery, for which various installations are illustrated. Other methods, seasonal oxidation lagoon, discharge equalization, dispersion in streams, barging, road-binding, and (for the kraft process) fibre removal are discussed and illustrated.

4563. MALCOLMSON, J. D. **The importance of paperboard as a forest product.** *For. Prod. J.* 6 (5), 1956 (198–200).

Contains data of annual output, manufacturing processes and uses.

862. Composite Materials made Wholly or Partly of Woody Matter

See also Nos. 4370, 4426, 4556.

4564. HELGE, K. **The influence of water quality on water absorption and thickness swelling of fibre building boards.** *Norsk Skogind.* 10 (3), 1956 (96–7). [E.nor.] P.R.

When pH was kept below 7, before and during testing, variations in pH value and in inorganic salt content had no effect on test results.

4565. CAMPBELL, R. L. **Automation in the board industry.** *For. Prod. J.* 6 (5), 1956 (33*A*–34*A*).

Discusses various automatic handling and control devices, and stresses their importance for obtaining a uniform product.

4566. BIBBY, R. D. **Manufacture and use of wood particle board.** *For. Prod. J.* 6 (5), 1956 (169–72).

Describes and compares multi-platen press and vertical and horizontal extrusion press processes, and gives some test and cost data, and notes on uses and machining.

4567. LOUIS, L. R. **Producing particle board by a continuous process.** *For. Prod. J.* 6 (5), 1956 (176–8).

Chiefly a description of the Bartrev press and its products.

4568. KING-SMITH, W. J. S. **Gold Label Weyroc—a new use for forest thinnings.** *Scot. For.* 10 (2), 1956 (88–93 + 2 photos).

An account of the Annan plant, which manufactures chipboard from coniferous thinnings [cf. *For. Abstr.* 16 (p. 304)].

4569. STEGMANN, G. Entwicklung und Herstellung der Holzspanplatten. **[Development and manufacture of chipboard.]** *Holz-Zbl.* 82 (68), 1956 (839–40). [G.]

A report on a meeting of the chipboard section of the German Wood Research Society, containing abstracts of the following papers: Accelerated curing (*W. Klauditz*)—discussing reduced initial moisture contents, the use of water sprays, steam and hot air; High-frequency heat in the production of chipboard (*K. Lamberts*); and The manufacture of thick light-weight chipboards and their properties (strength insulation etc.) (*H. J. Ulbricht*).

4570. CRAFTON, J. M. **Extruded chipcore board.** *For. Prod. J.* 6 (5), 1956 (173–5).

A description of process and equipment (on an automation basis), costs and product specifications.

4571. AKERS, L. E. **Chipboard and its use in furniture.** *Aust. Timb. J.* 22 (1), 1956 (60 . . . 82). [Furniture Development Council, London.]

A comprehensive account of development, types, methods of manufacture, and physical, strength and working properties.

4572. VAJSMAN, JA. E. Ob izpoljzovanii drevesnyh othodov dlja proizvodstva stoljarnyh plit. **[Use of wood waste for the manufacture of chipboards.]** *Derev. lesohim. Prom.* 3 (1), 1954 (18–21). 2 refs. [Russ.] From *abstr.* in *Prace Inst. Tech. Drewna* 1 (2), 1955 (90). [Pol.] P.R.

Describes the manufacture of boards made in the U.S.S.R. from sawdust and shavings (up to 30% moisture content) with a binder consisting of the waste of oleaginous plants (ca. 42 kg. of this material per 1 cu.m. of boards).

4573. FRASHOUR, R. G., and NIXON, G. D. **Hardboard from extracted Juniper chips.** *For. Prod. J.* 6 (2), 1956 (73–6).

Chips from *Juniperus occidentalis*, steam-distilled for recovery of volatile oils, and ground in an attrition mill, yielded (with or without resin or resin and wax) hardboards having an exceptionally high bending strength and water resistance, but less tough than hardboards made from other species. Density was increased by additives and higher pressing temperatures.

4574. Stillinger, J. R., and Coggan, W. G **Relationship of moisture content and flexural properties in 25 commercial hardboards.** *For. Prod. J.* 6 (5), 1956 (179–86). 5 refs.

Ten commercial boards, ⅛ or ¼ in. thick, made by wet, semi-dry, or dry processes, and classed as 'treated' or 'untreated', were conditioned at various relative humidities (r.h.) to an equilibrium moisture content (m.c.) that was generally 50 to 60% of that of wood under similar temperatures and conditions, the m.c. of treated boards always being lowest. In static bending tests, the modulus of rupture, modulus of elasticity and work to 0·2 in. deflection all increased as the m.c. decreased, reaching a maximum between 30% [air] r.h. and the oven-dry condition, while work to maximum load decreased because of the increasing brittleness of the boards. Oven-drying for up to 17 hours improved flexural properties. There was considerable variation in strength and flexural properties even among boards of the same type, the majority possessing directional properties. *From authors' summary.*

863. Wood Hydrolysis. Saccharification

4575. Hall, J. A., Saeman, J. F., and Harris, J. F. **Wood saccharification: a summary statement.** *Unasylva* 10 (1), 1956 (7–16). 56 refs.

Mainly a review of developments and possibilities indicating the more promising lines of research.

4576. Stranks, D. W. **Microbiological utilization of cellulose and wood. 1. Laboratory fermentations of cellulose by rumen organisms.** *Canad. J. Microbiol.* 2 (1), 1956 (36–62). 4 refs. O.R.S.

Fermentations of cellulose by rumen microflora gave butyric, propionic, acetic, and traces of formic, acid. An investigation is also being carried out, in which wood is used as a substrate in place of cellulose. Low grades of wood waste might be used. [Cf. *For. Abstr.* 13 (No. 4394).]

865. Plastics

4577. Perkitny, T., and Graj, L. Wykorzystanie odpadow fornirowych do tłoczenia dowolnie ukształtowanych elementow drewnianych. **[Utilization of veneer waste in moulded wooden elements of any shape.]** *Repr.* from *Przemysl Drzewny, Warszawa* 6 (8), 1955 (229–32). [Pol.] P.R.

A general description (without numerical data) of a novel kind of composite wood material developed in 1953–54 at the Polish Institute of Wood Technology, Poznań. Veneer waste, particularly knotless roundings ≯ 1 mm. thick, is comminuted to chips of a suitable shape and size; after drying, they are coated with glue (the weight of dry glue being 10–40% of the weight of the final product), put into suitable metal moulds and subjected to pressure. The arrangement of cuttings in the mould (% of cuttings ∥ to the main axis of the object) should be such as to result in optimum strength, swelling and shrinking properties in the final product. It is claimed that this new 'Lignofol' from wood chips is a very valuable material since (1) the maximum size of the final product is only limited by technical difficulties of heating and the power of the press; (2) the material can be moulded into any shape without waste; (3) there is only one major manufacturing operation and manufacture is rapid; (4) mechanical strength of the final product is very high, and so is its dimensional stability, while no checks or splits are likely to be formed as a result of inner stresses. This process is particularly suitable for manufacturing a wide range of curvilinear articles, e.g. sledge runners, lavatory seats, steering and other wheels, and barrel staves. [Cf. *For. Abstr.* 17 (No. 4506).]

866. Utilization of Wood Extractives

See also No. 4573.

4578. Prosiński, S., Kontek, W., and Siwek, K. Wpływ rozdrobnienia karpiny na przebieg i wydajność procesu ekstrakcji. **[Effect of the degree of comminution of [Pine] stumpwood on the nature and yield of the extraction process.]** *Prace Inst. Tech. Drewna* 1 (2), 1955 (42–59). 11 refs. [Pol.pol. russ.e.] P.R.

Laboratory tests showed that reducing the size of extraction chips gives a higher rosin yield with a much shorter extraction period. The highest rate of extraction occurs in the initial stage. It was found that the optimum mean length of chip is 10 mm., the other dimensions not exceeding 2–4 mm. The fines and dust should be eliminated, and chips below optimum size should be extracted as soon as possible after comminution. The effect of the grade of extracting solvent on the yield is discussed.

4579. Lella, E. F. di, and Rique, T. El palo santo, su industrialización. **[*Bulnesia sarmienti*, its utilization.]** *Publ. téc. Minist. Agric. Argent.* No. 20, 1955. pp. 31. 13 refs. [Span.]

Describes methods used in harvesting wood of *Bulnesia sarmienti* and in extracting and processing the essential oil. Notes are also presented on the properties and uses of the oil, and on possible uses of the resin and sawdust by-products, and of the wood itself.

89. Other ('Minor') Forest Products

891. Mineral Products (including Peat and Coal)

4580. Ferda, J. Dřevovitost rašelin. **[The content of wood fragments in peat.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 28 (3), 1955 (443–60). 11 refs. [Cz.cz.russ.g.]

A survey of modern methods (particularly those used in the U.S.S.R.) for determining the content of woody fragments (stumps, roots, etc.) in peat bogs.

892. Vegetable Products

892.1. Grass. Litter. Leaf Fodder etc.

See No. 3976.

892.4. Bark Products. Tanstuffs. Cork

See also No. 4417.

4581. Scott, D. S.; Scott, D. S., and Korach, P. **Recovery of tannin from Western Hemlock bark.**

I. Extraction rates with water as a solvent. II. Extraction rates with dilute alkaline solvents. *Pulp Paper Mag. Can.* 57 (5; 6), 1956 (139–41, 151; 147–50). 14 refs.

(I) Laboratory and pilot-plant extraction tests showed that probably only 50–70% of the analytical amount of tannin would be commercially recoverable even with relatively long extraction periods. Yields are improved with higher temperatures and higher-quality barks.

(II) Yields of tannin and time of extraction were improved as compared with water extraction. Extract solids were soluble in cold water and the solutions were stable on heating and at pH levels above 5·0. Extracts did not absorb O and were not subject to attack by fungi. *From authors' summaries.*

4582. ALEXA, G., STRUB, C., SIMIONESCU, C., MAGA, C., and DRABIC, I. **[Native [Rumanian] plant tanstuffs. Birch bark.]** *Studii Cercetăre Ştiinţifice* [*Bucarest*?] (*Ser. 2*) 1, 1950 (230–44). [Rum.?] From *abstr.* in *Chem. Zbl.* 126 (18), 1955 (4258). [G.] L.S.

The tannin content of the total bark is 2·17–5·78%; that of the inner bark rises from 7·18% (20–40 years) to 8·16% (40–60 years). In the outer bark tannins appear after the age of 40 years. The tannin/non-tannin ratio exceeds 1 for the inner bark when the tannin content exceeds 7%.

4583. ALA-UD-DIN, S., and AHMED, M.-U.-D. **Fixation and diffusion characteristics of the extracts of Goran, Sonari and Dahua barks.** *Pakistan Journal of Scientific Research, Lahore* 7 (1), 1955 (32–4). C.G.B.

Sonari (*Cassia fistula*) seems to rival Wattle in the characteristics tested. Although Goran (*Ceriops roxburghiana*) and Dahua (*Artocarpus lakoocha*) have a lower rate of diffusion, they appear to be of a similar nature to Sonari and could probably be used to advantage if blended with it.

4584. KHALIQUE, A., and AHMED, M.-U.-D. **Studies of indigenous tanning materials of E. Pakistan. Part 1. Leaching of Goran, Sonari and Dahua barks.** *Pakistan Journal of Scientific Research, Lahore* 7 (2), 1955 (51–3). 3 refs. C.G.B.

Tables present the results of leaching experiments at room temperature, 50°, 60° and 80° C. Goran (*Ceriops roxburghiana*), and Sonari (*Cassia fistula*) gave maximum tannin yields of 27·94% and 18·49% respectively at 60°, and Dahua (*Artocarpus lakoocha*) of 20·28% at room temperature.

892.5. Medicinal Plants, Edible Plants, Insecticides from Plants etc.

See also Nos. 3693, 4591.

4585. KHAN, A. H., and HUSSAIN, S. M. **Some observations on *Rauwolfia serpentina* Benth., its occurrence and scope of cultivation in East Pakistan.** *Pakistan J. For.* 5 (4), 1955 (230–40). 22 refs.

4586. GROCHOWSKI, W., *et al.* Badania owoców róż rosnących w Polsce. **[Investigations on fruits of *Rosa* spp. growing in Poland.]** *Roczn. Nauk leśn.* No. 8, 1955 (273–310 + 1 tbl.) 29 refs. [Pol.pol. russ.e.] (*Prace Inst. bad. Leśn.* No. 133.)

The following properties of rose hips are tabulated: diameter, length, weight, pulp content, vitamin C content, and chemical composition. The main species investigated were: *Rosa canina*, *R. rugosa*, *R. eglanteria*, *R. cinnamomea*, *R. dumetorum*, *R. glauca*, *R. rubrifolia*, and *R. tomentosa*. *R. rubrifolia* was found to have the highest mean vitamin content. *R. rugosa*, *R. rubrifolia* and *R. cinnamomea*, in that order, are recommended for vitamin production.

4587. BROMBERG, A., GROCHOWSKI, W., and MROŻEWSKI, S. Badania owoców borówki czernicy (*Vaccinium myrtillus* L.). **[Investigations on the fruits of *V. myrtillus*.]** *Roczn. Nauk leśn.* No. 13, 1955 (103–204). 18 refs. [Pol.pol.russ.e.] (*Prace Inst. bad. Leśn.* No. 149.)

Presents in tables and graphs the results of laboratory investigations with berries from over a dozen different places in Poland. The following properties were determined: total and extract dry mass, insolubles, total sugars, N compounds, mineral salts, pectins, vitamin C, yield of juice, size and fresh weight of berries and their resistance to crushing. Some correlations between properties were established.

892.6. Resin and Turpentine. Essential Oils. Fixed Oils and Fats. Gums. Latex. Dyestuffs. Sap Sugar

See also Nos. 3668, 3827.

4588. PATTON, E. L., and HOWELL, H. **New products from naval stores.** *For. Fmr.* 15 (6), 1956 (12–4).

Summarizes recent research at the Naval Stores Research Section, Olustee, Fla., on the components of Southern Pine resin, including the development of synthetic lubricants (esters of pinic acid) from turpentine.

4589. PROSIŃSKI, S., and PRZYBYLAK, A. Badania nad fizyko-chemicznymi zmianami zachodzącymi podczas przechowywania terpentyny i kalafonii. **[Investigations on physico-chemical changes occurring in turpentine and rosin during storage.]** *Sylwan* 99 (1), 1955 (85–92). 7 refs. [Pol.pol.]

The following properties were studied: (*a*) turpentine: density, refractive index, initial boiling-point, proportion of constituents distilling below 170° and below 180° C., colour, Br value, and acid value; (*b*) rosin: ash content, extraneous precipitates, softening-point, colour, acid value, saponification value, and content of unsaponifiable substances. Tests were made on materials stored for 0–7 months. It was found that storing turpentine in transparent vessels exposed to light results in an increase in acid value and darkening (some darkening also occurs when the vessels are made of dark material [glass?]). No changes were found in rosin, perhaps because of the short period of storage.

4590. PROSIŃSKI, S., and WILMAŃSKA, D. Z badań nad rozjaśnianiem kalafonii balsamicznej. **[Decolorization of [Pine] resin obtained by tapping.]**

Prace Inst. Tech. Drewna 1 (2), 1955 (60–83). 9 refs. [Pol.pol.russ.e.]

The results of tests show that: (1) oxalic-acid treatment considerably whitens rosin and the oxalic acid is recoverable; (2) ortho-phosphoric acid (H_3PO_4) is also a promising whitening agent, but its industrial use should be preceded by investigations on the utilization of the Fe phosphates and resinates obtained in this process; (3) decolorization by means of ultra-violet rays cannot be used on an industrial scale; (4) petroleum ether with oxalic acid enables both the coloured oxy-acids and the Fe compounds to be eliminated, but the low flame-point of petroleum ether is a serious disadvantage; (5) the best method economically is washing with water.

4591. ST.-OLIVIER, SOEUR, CÉLINE DU CARMEL, SOEUR, and BOIS, E. La gomme de sapin et les microbes. **[Canada balsam and bacteria.]** *Ann. ACFAS* 21, 1955 (69–73). 2 refs. [F.] L.S.

Tests of the antibacterial properties of *Abies balsamea* gum (both alone and in solutions of different kinds) show it to have definitely inhibiting effects on certain bacteria.

4592. **First symposium on research and development in Indian essential oils and aromatic chemicals.** *Indian For.* 82 (3), 1956 (141–8).

A general account of the symposium, held under the joint auspices of the Indian Council of Scientific and Industrial Research, and some of the papers.

4593. RAMASWAMY, M. N. **The essential oil resources of Mysore.** *Indian For.* 82 (3), 1956 (127–9).

Besides Sandalwood oil (of which it is the largest producer—ca. 2000 tons p.a.) the State produces Cinnamon leaf oil (ca. 6500 lb. p.a.), Geranium oil, patchouli, vetiver, peppermint and davana oil (from *Artemisia pallens*) and is the only commercial source of linaloe oil (from *Bursera delpechiana*).

4594. NAVES, Y. R. **Essential oil of seeds of *Myrocarpus frondosus* (Brazilian oleo pardo).** *Perfumery and Essential Oil Record* [*London*] 46, 1955 (183–4). From *abstr.* in *Chem. Abstr.* 50 (4), 1956 (2918). P.R.

The seeds yielded 0·74% of an oil whose properties are given. Cadinols and cadinene were identified.

4595. MARKLEY, K. S. **Mbocayá or Paraguay Cocopalm—an important source of oil.** *Econ. Bot.* 10 (1), 1956 (3–32). 22 refs.

Air reconnaissance has revealed a population of about 6 million *Acrocomia totai* in Paraguay. From 3000 to 4000 tons of oil are obtained annually from this wild palm. Its taxonomy, morphology, distribution, yield and utilization and the processing and analyses of its oil are detailed.

4596. PINTO, G. PEREIRA. O oleo de Bacába (Seu estudo químico). **[Bacaba oil—its chemical composition.]** *Bol. Sec. Agric. Ind. Com., Pernambuco* 22 (1/2), 1955 (4–11). 12 refs. [Port.e.f.g.]

The oil of Bacába (*Oenocarpus bacaba*) is very similar to Pataua (*Jessenia bataná*) oil, and can be used as a substitute for low-grade Pataua oil in all kinds of industrial application. *From author's summary.*

4597. HANCOX, N. C., and HATT, H. H. **The seed fat of *Mallotus philippinensis* (Kamala oil)—an examination of some Australian material.** *Qd. J. agric. Sci.* 12 (3), 1955 (58–60). 8 refs. O.R.E.

In the samples examined, both the seeds and the yields of kernels were smaller than in fruits from India, but yield and quality of oil were comparable. The kamlolenic acid content—on which its drying properties, resembling those of tung oil, depend—varied considerably between sample batches. Further botanical and chemical research is needed before commercial exploitation can be considered. [Cf. *For. Abstr.* 14 (No. 875).]

4598. HATT, H. H., and SCHOENFELD, R. **Some seed fats of the Santalaceae family.** *J. Sci. Food Agric.* 7 (2), 1956 (130–3). 9 refs. [Commonwealth Scientific and Industrial Research Organization, Melbourne.] O.R.S.

Seeds of *Santalum acuminatum*, *S. murrayanum* and *S. spicatum* were all found to contain ximenynic acid.

4599. RIQUE, T., and PARDO, L. L. Estudio de la goma obtenida de semillas de 'espina corona' (*Gleditsia amorphoides*). **[Study of the gum obtained from seeds of *G. amorphoides*.]** *Publ. téc. Minist. Agric. Argent.* No. 19, 1954. pp. 28. 13 refs. [Span.span.]

Results are presented of experiments on the extraction and chemical composition of gum from seeds of *Gleditsia amorphoides*. For comparison, data are also presented on the extraction and properties of gum from *Ceratonia siliqua*. A close resemblance between the two was found, and *G. amorphoides* gum has definite commercial possibilities.

4600. DIE, J. VAN. **A comparative study of the particle fractions from Apocynaceae latices.** *Annales Bogorienses, Bogor* 2 (1), 1955 (1–124). 239 refs. L.S.

A study of some aspects of latex-particle formation, based on an analysis of latex coagulate from ca. 40 species belonging to ca. 25 genera. The latex composition of one plant is nearly constant and variations within a species are slight, but between related species they are sometimes considerable. It is concluded that acetate carbons are the precursors of the particles and that they are built up into the main component in roughly the following proportions: polyisoprene 2–95%, triterpenol 5–90%, and fatty acids 0·2–35%. *From author's summary.*

4601. CLEMENTS, R. L. **A study of seasonal changes in the composition of Maple sap and syrup, with special reference to the anazotic and amino acids.** *Abstr. of thesis* in *Dissert. Abstr.* 16 (4), 1956 (642). [Ohio State University.] O.R.S.

Glutamic-acid content increased after midseason, but decreased again in late season when the sap contained large amounts of glutamine and increased amounts of valine and leucines. [Cf. *For. Abstr.* 13 (No. 4434).]

892.7. Fruits. Seeds. Fibres, Yarns and Flosses

See also Nos. 4586–7.

4602. IDNANI, M. A., and CHIBBER, R. K. **Utilization of seeds of wild leguminous plants and trees as manures.** *Sci. & Cult.* 21 (10), 1956 (599–600). 1 ref. [Indian Agricultural Research Institute, New Delhi.] E.M.B.

Seeds from 15 wild leguminous species (including *Sesbania aegyptiaca*, *Prosopis juliflora*, *Bauhinia variegata*, *Pongamia pinnata*, *Cassia occidentalis*, *C. auriculata* and *Dalbergia sissoo*) were chemically analysed for N, P, and K. Tabulated results show that all contained substantial amounts of nutrients, especially N (2·86–6·56%). In laboratory experiments, seeds were crushed and added to the soil, and the degree of nitrification was determined during 10 weeks; the amount of mineral N nitrified and available to plants was 47–69% by weight of seeds that had been soaked until they began to sprout before crushing, and 42–49% for seeds crushed without soaking. In pot culture experiments, significant increases occurred in the yields of grain and straw of wheat manured with soaked crushed seeds of *S. aegyptiaca* or *B. variegata* at the rate of 80 lb. N/acre.

892.8. Heather. Broom etc. Osiers. Canes and Bamboos. Reeds and Rushes. Thatching Materials

See Nos. 3698, 3976, 3991–2.

893. Animal Products

4603. SRINIVASAN, M. M. **Lac: its cultivation and manufacture in India.** *Indian For.* 82 (1–5), 1956 (5–7; 93–6; 139–40; 180–9; 242–51).

9. FORESTS AND FORESTRY FROM THE NATIONAL POINT OF VIEW. SOCIAL ECONOMICS OF FORESTRY

90. General

4604. **Forest policy.** [*Docum.*] *8th Sess. FAO European For. Comm., Rome 1955* No. *FAO/EFC/81-T*, 1956. pp. 33. [E. or F.]

Summaries of the statements made before the Commission by observers from Eastern Germany, Bulgaria, Hungary, Poland, Rumania, Czechoslovakia, and the U.S.S.R.

4605. KRAJSKI, W. Z zagadnień rozwoju gospodarstwa leśnego. **[Some problems of forestry development.]** *Roczn. Nauk leśn.* No. 8, 1955 (3–108). 116 refs. [Pol.] (*Prace Inst. bad Leśn.* No. 129.)

Analyses some theoretical assumptions and experiments in the U.S.S.R. on the rational deployment of natural resources and the methods of their utilization. Particular attention is paid to the question of the rational distribution and utilization of forests from the standpoint of the national economy, including the purely economic and biological aspects. One-half of the references are Russian.

4606. SCHINDLER, U. Die forstliche Situation in Jugoslawien—unter besonderer Berücksichtigung der Forstverwaltung und der forstlichen Forschungsstätten. **[The forest situation in Jugoslavia—with special reference to administration and research.]** *Forstwiss. Cbl.* 74 (7/8), 1955 (238–46). 4 refs. [G.]

A review, including data on the administrative divisions and teaching centres in each Republic. [Cf. *For. Abstr.* 14 (No. 4099); 17 (No. 2298).]

4607. **Forest policy in Egypt.** [*Docum.*] *1st Sess. Near East For. Comm., Teheran 1955* No. *FAO/NEFC/13-B*, 1956. pp. 5.

4608. DANA, S. T. **Forest and range policy: its development in the United States.** McGraw-Hill Book Co., Inc., New York. 1956. pp. xi + 455. 9 pages of refs. Price $6·50 [£2. 9*s.*]

An historical account of the development of conscious direction of policy in regard to forestry, range management and soil and water conservation generally.

902. History of Forests and Forestry

4609. GÉNY, P. Le passé de la région forestière du Donon. **[The history of the forest region of Donon [Meurthe-et-Moselle].]** *Rev. for. franç.* 8 (4), 1956 (237–44). [F.]

An account of these forests from the 16th to 18th centuries, derived from the archives of the Department of Meurthe-et-Moselle.

4610. SUSMEL, L. Tecnica dei Veneziani nei boschi di rovere. **[Venetian silvicultural techniques in Oak woods.]** *Monti e Boschi* 7 (5) 1956 (212–22). [It.f.e.]

After a short account of forest legislation in Venice in the 15th and 16th centuries, describes the silvicultural methods used in Oak (*Quercus robur* and *Q. sessiliflora*) woods for the production of naval or building timbers. Examples are given of the *catasti* or inventories of timber assortments, and stand and site descriptions.

4611. TISSEVERASINGHE, A. E. K. **Land tenure and forest law in ancient Ceylon.** *Ceylon For.* (*n.s.*) 2 (3), 1956 (124–30). 17 refs.

903. Forest Policy, General

4612. TIWARI, K. M. **Forestry in the second [Indian] five-year plan.** *Indian For.* 82 (3), 1956 (130–8).

4613. RAI, L. **Forests of Orissa—the second five-year plan.** *Indian For.* 82 (5), 1956 (219–24).

904. General Regional Accounts of Forests and Forestry

See also Nos. 4654–5.

4614. MORANDINI, R. Brevi note sulle foreste della Corsica. **[Short notes on the forests of Corsica.]** *Monti e Boschi* 7 (4), 1956 (158–65). [It.]

4615. PERRAULT, L. Un voyage d'études en Sardaigne. **[A study tour in Sardinia.]** *Rev. for. franç.* 8 (4), 1956 (291–304 + 4 photos). [F.]

4616. Litt om skogforhold og skogsdrifter i Ukraina og Karpatene. **[Forest conditions and forest concerns in the Ukraine and the Carpathians.]** *Norsk Skogbr.* 2 (10), 1956 (339 . . 344). [Nor.]

A brief account, based on information given by members of a Russian forestry delegation visiting Norway, of forest area and distribution, felling, skidding, transport by cableways and forest railways, the wage system, and training and education.

4617. HOWARD, SIR H. **Forests of South Korea. (Part I.) The present position.** *Emp. For. Rev.* 35 (1), 1956 (56–63).

The article starts with the basic facts on topography, climate, soils, area including forest area, distribution of population, demands on the forests, with a short paragraph on shifting cultivation. Next the forest area is described in greater detail, including notes on forest products, major and minor, and on the protective function of forests. Then forest organization is discussed under staff, management, erosion and torrent control, and forest industries. Finally, the author deals with such questions as the forest inventory, the forest policy protective and productive, and the control of private forests, ending with suggestions regarding forest legislation. *Author's summary.*

4618. BOUDY, P. Économie forestière nord-africaine: Tome quatrième. Description forestière de l'Algérie et de la Tunisie. **[Forestry in [French] North Africa. Vol. 4. Description of forests and forestry in Algeria and Tunisia.]** Éditions Larose, Paris. 1955. pp. xii + 483 + 93 photos + 7 maps. [F.]

Algeria and Tunisia are treated in separate sections, with separate indexes. Within the sections, individual forests, arranged by ownership, are described region by region with detail of area, species, management and yield, and there are general accounts for each region of climate, physical surroundings, distribution by land ownership, and yield. There is a review of the present situation and discussion of future prospects in each country, including, for Algeria, forest statistics (area and distribution, production 1939–51, production of cork and tanbark, reserves), work in progress (soil protection and restoration, protection and improvement of Cork-Oak and Aleppo-Pine forests, afforestation, housing, roads, firebreaks etc.), and conclusions; and for Tunisia, the land situation, the economic situation (yield, grazing, fires, afforestation and soil restoration, housing, roads etc.), prospects and conclusions. [Cf. *For. Abstr.* 12 (No. 1874).]

4619. D. Die Forst- und Holzwirtschaft von Honduras und El Salvador. **[Forestry and timber industry in Honduras and San Salvador.]** *Holz-Zbl.* 82 (43), 1956 (559). 7 refs. [G.]

A general account of the main commercial species, industrial development, timber export etc.

4620. Bos en bosbeheer in Suriname. **[Forests and forest administration in Surinam.]** Dienst Landsbosbeheer [Surinam]. [1955]. pp. 42. 11 refs. [Du.] P.R.

Includes descriptions of vegetation types; a list of the important species, their properties and uses; production and export figures; and tabulated data on volumes and numbers of trees over 35 cm. diam. per ha., by region and vegetation type, for 34 species.

4621. SARLIN, P. **The forests of New Caledonia.** [*Transl. For. Res. Inst. N.Z. For. Serv.*] [1956?] pp. 10. A partial translation by G. C. Weston and H. Q. Varekamp of *Bois For. Trop.* No. 12, 1949 (393–406). Limited distribution.

905. Forest Statistics and Resources

See also Nos. 4360–1.

4622. Estadística forestal de España. Año 1950–51. **[Forest statistics for Spain, 1950–51.]** Servicio de Estadística, Ministerio de Agricultura, Madrid. 1953. pp. 140 + 11 maps + 3 dgms. [Span.]

Includes also figures for Spanish Morocco and Guinea.

4623. Estadística forestal de España. Año 1951-52. **[Forest statistics for Spain, 1951–52.]** Servicio de Estadística Ministerio de Agricultura, Madrid. 1954. pp. 145 + 10 maps + 3 dgms. [Span.]

Includes also figures for Spanish Morocco and Guinea.

4624. ILVESSALO, Y. **Finland's forests in the light of three national forest surveys.** *Econ. Rev., Helsinki* 1954 (4), (158–65). [E.]

Chiefly a discussion of tables showing changes in forested area, mean volume/ha., total growing stock, its distribution by species and diameter class, and annual increment, as disclosed by the surveys of 1921–24, 1936–38, and 1951–53. The general picture is encouraging.

4625. **Forest resources of the Buffalo Narrows—Beauval area of Saskatchewan.** *For. Invent. Ser. For. Br. Sask.* No. 5, 1956. pp. 36 + map.

4626. FERREE, M. J., and DAVIS, J. E. **Forest acreage and timber volume in the Adirondack and Catskill regions [N.Y. State].** *Bull. N.Y. St. Coll. For.* No. 35, 1954. pp. 91. Price $0·80.

4627. LARSON, C. C. **Timber resources and the economy of the Saranac Lake—Lake Placid area [N.Y. State].** *Bull. N.Y. St. Coll. For.* No. 32, 1954. pp. 42. Price $0·75.

4628. ARMSTRONG, G. **The forests and economy of Lewis County, New York.** *Bull. N.Y. St. Coll. For.* No. 33, 1954. pp. 49. Price $0·75.

907. Indirect Significance of Forests (Rural Amenity, National Parks, Forest Influences etc.)

See also section 116.

4629. **[National parks and reserves as centres of scientific research, instruction and education.]** *Sylwan* 100 *A* (1), 1956 (46–71). [Pol.]

Includes reports of communications presented at a conference held on 2–4 June, 1955, at Białowieża, and minutes of the discussion. The addresses and communications are: (1) The part played by national parks and reserves in the light of the present state and needs of national culture (*Z. Czubiński*); (2) The specific nature of investigations in the National Park of Białowieża in the network of Polish national parks and reserves (*A. Dehnel*); (3) Significance of the National Park of Białowieża for forestry (*T. Trampler*); (4) Range and trends of past investigations in the National Park of Białowieża (*S. Graniczny*); (5) The projected organization of forestry research in national parks and reserves (*Z. Obmiński*).

4630. MORGAN-DAVIES, A. M. **The reserves and sanctuaries of Ceylon.** *Oryx* 3 (3), 1955 (129–33 + 2 photos).

Gives details of the status, and a location map of the sanctuaries, strict natural reserves, intermediate (buffer) zones, and national parks. These reserves total 1728 sq. miles or 6·28% of the island area.

4631. **Roosevelt National Forest of Colorado.** Rocky Mountain Region, U.S. Forest Service, Denver, Colorado. 1955. 1 sheet.

Brief descriptive notes and a map.

4632. BOYKO, H. **The function of natural vegetation as a guide to higher productivity.** [*Pap.*] *6th tech. Mtg. int. Union Prot. Nature, Edinburgh 1956* No. *IUPN/A.G.* 5/*R.T.*6/IV/9, 1956. pp. 8. [E.e.f.]

A plea for the creation of nature reserves, e.g. in virgin forest, on sand dunes etc., to serve as laboratories for the study of methods of ameliorating agricultural and forestry production.

91. Land Use, Land-Use Policy (Including Afforestation Policy)

See also Nos. 4605, 4608, 4654.

4633. ROBERTSON, C. J. **The expansion of the arable area.** *Scot. geogr. Mag.* 72 (1), 1956 (1–20). X.

The rate of growth of cultivation in the major regions of the world and its causes and patterns are outlined, more particularly since 1870, with special reference to the 'agro-pastoral' and 'agro-forestal' frontiers and the place of each country in the pattern of tripartite land use (arable/pastoral/forest). The latter is compared diagrammatically for (*a*) mid-latitude, (*b*) other countries of the world, and the problems and dynamics of spread, recession and equilibrium are discussed in some detail.

4634. DEGO, G. Un équilibre sylvo-pastoral est-il possible en Corse? **[Is a balance between forestry and pastoral husbandry possible in Corsica?]** *Bulletin de la Fédération Française d'Économie Alpestre* (*n.s.*), *Grenoble* No. 5, 1955/56 (89–96 + 4 photos). [F.]

Describes the difficulties involved in persuading the Corsican peasant to confine his flocks, improve pasture etc. One of the chief enemies to forestry is the free-ranging pig.

4635. BENDA, P. Recherche d'un équilibre sylvo-pastoral à la Réunion. **[In search of a balance between forestry and pastoral husbandry in Réunion.]** *Bulletin de la Fédération Française d'Économie Alpestre* (*n.s.*), *Grenoble* No. 5, 1955/56 (149–61 + 4 photos). [F.]

Describes the degraded forests of *Acacia heterophylla* and *Sophora nitida*, and discusses the measures necessary (1) to protect and rehabilitate these forests, (2) to improve the breed and management of cattle while preventing destructive grazing on forest land.

92. Forest Ownership and Ownership Policy

See also No. 4611.

4636. Foreste demaniali pistoiesi. **[Domanial state forests in Pistoia.]** Azienda di Stato Foreste Demaniali. [1956?] pp. 28 + 3 maps + 6 gphs. [It.]

Gives an account of 10 years' administration by the A.S.F.D. of these forests, with details of management, and particularly of engineering works.

4637. **[Map of] Western Region of Nigeria showing forest reserves. [Scale 1 : 3,000,000.]** *Rep. For. Adm. west. Reg. Nigeria 1953/54*, 1954 (5, 9).

Shows names and boundaries of reserves, with roads, railways, and rivers and chief centres. Constituted reserves of the region now contain 7066 sq. miles. This represents 15·55% of the total land area, and will probably be increased soon to 16·19% (4383 sq. miles of high forest, 2956 of savanna and 10 of mangrove).

4638. **[Forest estate, British Somaliland.]** *Rep. Dep. agric. vet. Serv. Somaliland Prot. 1955* [1956?] (21).

Gives tables and a map of the reserves fully constituted up to 31 Dec. 1955 and of those proposed, totalling respectively 243 and 672 sq. miles.

93. Public Supervision and Regulation of Forestry, Including Legislation for these Purposes

See also Nos. 4064, 4610–1.

4639. **The dedication of woodlands: principles and procedure.** *Bookl. For. Comm., Lond.* No. 2 (4th ed.) 1956. pp. 60.

[Cf. *For. Abstr.* 12 (No. 1653).] Includes deeds of covenant for England and Wales and agreements for Scotland, forms for plan of operations and accounts.

4640. **Forest and Rural Fires Act, 1955: an act to consolidate and amend certain enactments of the General Assembly relating to the prevention and suppression of forest and rural fires, and with respect to matters incidental thereto.** New Zealand Government, Wellington, New Zealand. No. 44, 1955. pp. 40. Price 1*s.* 6*d.*

94. Other Methods to Implement Forest Policy

941. State Subsidies etc.

See No. 4639.

942. Credits

See also No. 4639.

4641. Berge, A. R. **A banker looks at forest credit.** *J. For.* 54 (4), 1956 (227–30). 3 refs.

The Federal Reserve Act, amendment 1953, allows the national bank to lend up to 40% of the value of properly managed merchantable stands on a first mortgage for 2 years, or 10 if an annual amortization of 10% is included. The rôle of banks and insurance companies in developing forestry, and the exaggerated idea of the fire risk (balanced as it is by substantial salvage income) are discussed.

943. Forest Insurance

See No. 4641.

945. Advisory Services; Publicity, Propaganda; Education, Training; Research

4642. Hahn, U. **Forestry extension services in the Federal Republic of Germany.** *Unasylva* 10 (1), 1956 (17–8).

945.2. Publicity, Propaganda (including Demonstration Forests)

4643. Kazlauskas, J. B. **School forests of New York State, their number, location, size, origin, development and use.** *Abstr. of thesis* in *Dissert. Abstr.* 16 (2), 1956 (277). [Cornell University.] O.R.S.

Returns from 157 schools owning forests ranging in size from $\frac{1}{8}$ to 361 acres indicated that most of them were used very little for either teaching or recreation.

945.3. Education. Training

See also Nos. 4606, 4616, 4643.

4644. Strzemski, M. Z dziejów wyższego szkolnictwa leśnego. **[History of forestry colleges.]** *Sylwan* 100*B* (2), 1956 (36–42). 75 refs. [Pol.]

Describes in some detail the evolution of colleges of forestry in Germany, Austria, Russia and Poland.

4645. Gieruszyński, T. Dziewięć lat istnienia Wydziału Leśnego Uniwersytetu Jagiellońskiego. **[The Forestry Faculty of the Jagellonian [Cracow] university and its 9 years of existence.]** *Sylwan* 99 (4), 1955 (309–17). [Pol.]

Gives some statistical data on the activities of the faculty, which lasted from 1945 until 1954 when it was abolished, and lists the 80 publications of its staff.

4646. Herbert, P. A. **Adjustments in forestry education.** *J. For.* 54 (4), 1956 (236–7). [Michigan State University, East Lansing.]

Proposes in detail a 5-year university curriculum for the education of personnel capable of administering multiple-resource forests in the U.S.A. A special aim is the more efficient use of time by a rearrangement of basic subjects, some of which are new.

4647. **Fifty years of forestry at Oregon State College.** Oregon State College, Corvallis. 1956. pp. 24.

An account of the history and achievements of the school of forestry.

4648. **The vocational training of forest workers.** Joint Committee on Forest Working Techniques and Training of Forest Workers, Geneva. No. *FAO/EFC/LOG*/54, 1955. pp. 74. (Also a French version, pp. 83.) 42 refs. Obtainable from the Sales Section, European Office of the United Nations, Geneva. Price: *Swiss Fr.*2.50 ($0.60, 4*s.* 6*d.*).

A report based on a questionnaire to member governments (Austria, Denmark, Finland, France, eastern and western Germany, Netherlands, Norway, Rumania, Sweden, Switzerland, United Kingdom, U.S.A., and U.S.S.R.) on organization, curricula etc. of establishments (e.g. forest ranger schools) for training forest workers. Includes a list of textbooks, manuals etc. currently used in different countries.

945.4. Research

See also Nos. 3777, 4134, 4369, 4606, 4629.

4649. Fernandes, C. Taveira. A Estação de Experimentação do Sobreiro e Eucalipto as serviço do país. **[The Cork Oak and Eucalypt Experiment Station at the nation's service.]** *Agros* 38 (3/6), 1955 (261–75). [Port.]

Reviews briefly the past and present work of the Experiment Station at Alcobaca, which includes not only studies on Cork Oak, Eucalypts and Chestnut, but also research on wood technology and on pulping of Portuguese species.

4650. Oliveira, A. Franco de. Posição actual do estudo dos solos florestais. **[The present state of research on forest soils [in Portugal].]** *Agros* 38 (3/6), 1955 (388–94). [Port.]

Reviews past work of the 'Laboratorio de Pedologia Florestal', at present located in the Instituto Superior de Agronomia, and outlines a plan for future research.

4651. Progreso realizado en las investigaciones agrícolas durante el año 1954. **[Progress made in agricultural research during 1954.]** *Idia* No. 90/92, 1955. pp. 192. [Span.] C.G.B.

This special issue gives brief summaries of work in progress at agricultural experiment stations in Argentina. The work covers mainly agricultural crops, but the following projects of interest to foresters are in progress: crossing and selective breeding of Willows at the Instituto de Botánica Agrícola; study of mycorrhizae of forest trees—Instituto de Microbiologica Agricola; pests of Pine, *Salix alba* var. *calva*, Poplars and Eucalypts, and a disease of Poplar caused by *Verticillium albo-atrum*—Instituto do Sanidad Vegetal; trials of Eucalypts to discover the best producers of box-shook timber—Estación Experimental de Concordia (Entre Rios); trials of forest species for farm woodlands—

Estación Experimental do Rafael (Santa Fé); and soil conservation in Misiones—Estacion Experimental Cerro Azul (Misiones).

946.1. Associations. Societies

4652. DANA, S. T. **The American Forestry Association's first eighty years.** *J. For.* 54 (3), 1956 (163–71).

Traces the record of achievement from 1875, when there was in the Union not a single practising forester, nor a managed acre of forest, to 1955 when the former number 16,000 and the latter, millions of acres.

946.2. Conferences and Excursions

See also No. 4061.

4653. **Proceedings of Conference on Industrial Forest Management [of Southern Pine] June 8, 9, and 10, 1954.** School of Forestry, Duke University, N.C. [1954?]. pp. 129.

Includes the following papers, with discussions: Natural regeneration (*S. B. Kinne, Jr.*, and *G. R. Condit*); Artificial regeneration (*E. E. Jones*); Use of fire as a regeneration tool (*S. N. Cooper*); Forest type conversion (*P. T. Lannan, Jr.*); Site quality determination (*L. F. Kalmar*); Site improvement (*D. D. Stevenson*); Forest inventories (*N. T. Barron* and *J. P. Wright*); Thinnings (*H. F. Lathrop* and *P. M. Garrison*); Growing stock levels (*S. A. Boutwell*); Rotation length and stand form (*F. A. Dowdy*); Cutting schedules (*G. A. Anderson*); Research by forest industry (*J. W. Johnson*).

4654. Voyage d'études en France dans le sud du massif central. **[A study tour in the south of the central massif of France [Avignon to Carcassonne].]** École nationale des Eaux et Forêts, Nancy. 1956. pp. 78. [F.] (*FAO Jt. Subcomm. Medit. For. Probl.*).

Includes addresses on: afforestation and land use (*F. du Vignaux*); the southern edge of the central massif (*P. Chabrol*); rural equilibrium on the southern edge of the central massif (*J. Prax*).

4655. Voyage d'études en France dans la région provençale. **[A study tour in the Provençal region of France.]** Ecole Nationale des Eaux et Forêts, Nancy. 1956. pp. 90. [F.] (*FAO Jt. Subcomm. Medit. For. Probl.*)

Includes addresses on: Mediterranean forests and forestry (*P. Guinier*); and the forestry problem in Mediterranean France (*A. Dugelay*).

95. Forest Taxation

4656. WILLIAMS, E. T. **Tax assessment of forest land and timber shows improvement.** *J. For.* 54 (3), 1956 (172–6). 32 refs.

[Cf. *For. Abstr.* 13 (No. 882).] Private forest lands constitute > 20% of the land area of the U.S.A. and the value of the commercial timber subject to property tax may well exceed $10,000 million. The 'extended instructions' of 8, and the separate timber assessment manuals of 3 states are discussed. The general property tax though losing ground relatively in federal, is still dominant in local, government revenue, and seems likely to remain so. Maladjustments in forest taxation have been rectified either through special forest taxes exempting from property tax the whole or part of standing timber and sometimes bare forest land, or through improved assessment of the general property tax.

4657. HUFF, R. D. **Federal [U.S.] taxation of income from timber.** *J. For.* 54 (4), 1956 (254–7). 4 refs.

A summary of advice to foresters and private owners concerned in assessments and payments of the tax, bringing out particularly the distinction between conditions where taxation of normal and of capital gains apply. [Cf. *For. Abstr.* 14 (No. 4044).]

96. Forest Labour Questions. Labour Questions in Wood Transport and the Wood Industries

See No. 4616.

97. International Forest Policy and Other International Collaboration

See also Nos. 3813–6.

971. Congresses. Conferences

4658. **Report of the 8th Session of the Conference [of FAO] 4–25 November 1955.** FAO, Rome. 1956. pp. 270. [E.F.Span.]

4659. **Report of the first session of the Teak Sub-Commission.** [*Pap.*] *1st Sess. FAO Teak Sub-Comm., Bangkok 1956*, 1956. pp. 43.

Contains a report of an *ad hoc* committee on grading rules.

FORESTRY THE WORLD OVER

References: 1. *Aerial Survey Review*, London; 2. *Boletim da Junta Nacional da Cortiça*, Lisbon; 3. *British Columbia Lumberman*, Vancouver; 4. *Forest Products Journal*, Madison; 5. *Forêt-Conservation*, Quebec; 6. *Forst- und Holzwirt*, Hanover; 7. *Holz-Zentralblatt*, Stuttgart; 8. *Journal of Forestry*, Washington; 9. *Lumberman*, Seattle; 10. *Nature*, London; 11. *New Zealand Forest Service Monthly Newsletter*, Wellington; 12. *Quarterly Journal of Forestry*, London; 13. *Southern Lumberman*, Nashville, Tennessee; 14. *Timber Trades Journal*, London; 15. *Times*, London; 16. *Unasylva*, Rome.

International.

FAO.

	1956	
20 Aug.–30 Sept.	Study tour on rôle of forest cover in protection and utilization of arid-zone soils.	USSR
	1957	
Jan. or Feb.	Asia-Pacific Working Party on Watershed Management (ETAP).	India
September.	International Chestnut Commission.	Athens

Other Conferences.

	1957	
April–May.	3rd International Congress on Irrigation and Drainage.	San Francisco
	1958	
20–28 August.	10th International Congress of Genetics.	Montreal
Undecided.	9th International Botanical Congress.	Montreal

Antarctica. The unpainted wooden houses built by Captain R. F. Scott and Sir Ernest Shackleton on Ross Island have withstood gales and complete blanketing by snow for about half a century. The soft grain on the windward side of the oldest hut had been etched out by driving snow and rock particles to a depth of ¼ in., leaving the harder grain standing out in an attractive pattern (**13**; 1.6.56).

Argentina. The first school of forestry in Argentina has been founded by the Faculty of Agronomy and Veterinary Science at the University of Buenos Aires. Students will take a 2-year course in forestry after a 3-year course in agriculture (**5**; July/Aug. 1956).

Bulgaria. According to the latest statistics furnished to FAO, forest land amounts to 33% of the land surface of Bulgaria, 5% more than the average for Europe. High forest forms 60% of all wooded forest land, 14% being coniferous and 46% deciduous. In the latter, Beech is the most important species and one of the main sources of building timber. For management purposes the forests are divided into 7 categories: (1) the protective, water-regulating forests, occupying 50·7% of the total; (2) the State forest belts 0·4%; (3) health-resort forests 1·8%; (4) preserved forest 0·2%; (5) eroded forest lands 6·8%; (6) forests of the green belt 1·8%; (7) protective industrial forests 38·3%. It is intended to convert much of the coppice to high forest. In high forest, both coniferous and deciduous, the trend is towards progressive and group-selection fellings. In the high mountains on steep slopes, and in the neighbourhood of reservoirs, only selection felling is practised.

Clear felling in high forest is forbidden and is only allowed in forests of low growth where the felling cycle is 20–30 years (**16**; May 1956).

Canada. A simply adapted shotgun, with slug-type cartridges from which most of the wadding has been removed and replaced with a mixture of a dye and a finely powdered tree poison, can be used to kill and bark trees in the spring and summer sap-peeling seasons. The gun is held horizontally against the tree and fired. The slug punches a hole in the bark and the explosive force lifts the bark and distributes the poison over an area of 2 sq. ft. or more, the bark afterwards collapsing and resuming its original position. The poison, in contact with the cambium, phloem, and xylem, is rapidly absorbed into the circulatory system. The dye, very finely powdered, allows a study of the distribution of the chemical and also helps to lift the bark over a wide area. The operator should not hold the gun to his shoulder but fire it from beside and behind; goggles and a respirator should be worn if toxic chemicals, e.g. sodium arsenite, are used (**3**; May 1956).

Experiments have been made by the Ontario Division of Forest Protection in laying hose-pipe by helicopter over wooded country. Tests were made with 300 ft. of pipe in a bag in the helicopter, one end of the pipe being attached to a pressure pump on the edge of a water supply. The pipe was paid out by hand above a wooded area with trees ca. 60 ft. high. The pressure obtained at the outlet of the pipe was 40–45 kg. The recovery of the hose pipe presents some difficulty, but this is more than compensated by the advantages of rapid laying (**5**; July/Aug. 1956).

It is planned to build a new pulp and paper research laboratory near Montreal at a cost of two million dollars. The laboratory, financed by the Government, is to be operated by the Pulp and Paper Research Institute of Canada (**4**; May 1956).

A special railway truck for conveying pulpwood has been designed by the C.N.R. It will carry much larger loads than the trucks at present used (up to 70% more), measures 50 ft. 10 in. in length, and will hold 29 cords of green pulpwood (**5**; July/Aug. 1956).

Brunette Machine Works Ltd., New Westminster, B.C., have developed a new type of portable barker, on a fixed foundation or mounted on skids, for small mills or for barking in the woods. Barking is done by 2 diametrically opposed scraper heads, brought into contact with the log by counterweights. The barker handles logs of diam. 8–26 in., and length 10 ft. 3 in. to 24 ft. Feed averages 30 ft./min. (**9**; July 1956).

Germany. A Forestry Secretary has recently been appointed to the Washington embassy of the German Federal Republic. He is the only forester of such diplomatic rank in Washington. The U.S. itself has no forestry attachés abroad (**8**; May 1956).

A skidding winch which works on an ultrasonic remote-control principle has been demonstrated in Germany. With a blast on an ultrasonic 'whistle' the man working at the log can start and stop the winch (**6**; 1.7.56).

Great Britain. The Forestry Commission has recently acquired the Westonbirt Arboretum in Gloucestershire. It covers more than 100 acres and is a unique collection of trees and shrubs, founded about 1820 by the ancestors of the late Sir George Holford. Oaks, Yews and conifers form a background to numerous rare specimens of trees and shrubs collected from many parts of the world, particularly China, Japan, and the western States of America (**10**; 14.7.56).

Among four new nature reserves recently established in Scotland is Rassal Ashwood in Wester Ross. Rassal, which has been purchased from the Forestry Commission, is situated on a small outcrop of Durness limestone near the head of Loch Kishorn. Here is one of the few natural, or semi-natural, Ash woods in Scotland, and the most northerly in Britain. Oaks, Blackthorn and Hazel are associated with the Ash, and the wood has a rich ground flora (**15**; 15.6.56).

Research into the possibility of identifying tree species and vegetation associations on air photographs by the use of various films and filters is being undertaken by the Forestry Division of Hunting Technical Services Ltd. Tests in Great Britain have been carried out over Alice Holt Forest, using two cameras simultaneously and various combinations of films and filters, including panchromatic, infra-red, and colour films. Two prints covering the same area were compared and, where individual trees or forest stands appeared to have a similar tone on panchromatic film, but different tones on infra-red film, a field check was made to see whether this was due to a difference in species. In many instances this was found to be the case, and Hunting's associate company in Canada have used infra-red photography for a number of forest surveys. Further work on these lines is under way, with particular reference to the identification of commercially valuable tree species in tropical rain forest. Tests have been made in British Honduras and British Guiana, and are to be made in Ceylon (**1**; Summer 1956).

Laminated timber beams 50 ft. long have been used to support a new footbridge over the river Sid at Sidmouth in S. Devon. Each beam consists of seventeen 1 × 7-in. laminates of Douglas Fir glued with Cascophen R.S. 240-M resin. Scarf-joints in the laminates are 6 in. long (**12**; July 1956).

A new water-repellent wood preservative, 'Cuprinol Sealer', to reduce the movement of wood exposed to moisture, has been evolved by Cuprinol Ltd., London. It is said to reduce water absorption by 85%. It reduces cracking and distortion and protects joinery exposed on building sites. The new sealer also incorporates the metallic salts forming the basis of Cuprinol wood preservatives (**14**; 18.8.56).

Liberia. FAO is founding a school for forestry in Monrovia under the Directorship of Dr. Querengässer (**7**; 7.6.56).

New Zealand. In Timaru are made New Zealand's requirements of toothpicks and florists' pegs. After much experimenting, in which the Forest Service lent a hand, they are now made exclusively of Southland Beech [*Nothofagus menziesii*]. The same factory manufactures two other important articles—icecream spoons and chocolate-bomb sticks—also from Southland Beech (**11**; June 1956).

Portugal. A new movement for the encouragement of agriculture in Portugal is to include the organization of technical aid for forestry. One object of this technical aid programme will be to simplify and amend the present complex forest law, and to organize local propaganda and advisory services (**2**; March 1956).

Sweden. KP, a new Swedish wood preservative, consists of copper compounds, pentachlorophenol, and other chemicals. After vacuum impregnation, up to 95% of the copper compounds become fixed in the wood, and after the wood has been in store for a short time the pentachlorophenol precipitates into compounds that are very resistant to leaching. There is no poisoning risk to humans or animals and the wood can be burned without producing poisonous gases. The treatment improves the electrical resistance and water-repellent properties of the wood. Swedish State Railways are using the new preservative for sleepers, and it is being used for telephone and telegraph poles and building timbers (**3**; May 1956).

U.S.A. Cloud seeding as a means of preventing or reducing the severity of lightning will be tested in Arizona as part of a co-operative programme known as Project Skyfire. Experiments will be carried out in the Coconino National Forest where lightning causes hundreds of fires annually. Lightning is the cause of 65% of forest fires in the Rocky Mountain states and 42% in the Pacific states. A specially built mobile radar unit will detect, track, and analyse lightning storms, and will assist in comparing the results on seeded and unseeded cloud systems. This is the first use of radar in forest fire control. Actual seeding will be exploratory only and will be limited to the occasions when isolated storms develop that are suitable for this type of study. Silver iodide will be employed as the seeding agent, either from a ground generator into ascending air currents or from an aeroplane. The silver iodide crystals act as nuclei for the formation of ice crystals in the clouds, and this reaction may, under some conditions, affect the life history of the cloud, which in turn could alter the lightning potentialities of the storm. [Cf. *For. Abstr.* 16 (No. 3722)] (**8**; July 1956).

The 'Insta-Pumper' a new type of fire-fighting unit, including a 90-gal. tank, self-priming pump etc., has an electric motor that runs off any vehicle battery. It is automatically and remotely controlled by regulating the hose nozzle, and has a normal output of 7 gal./min. (**13**; 15.6.56).

The Iowa State Conservation Commission has developed and tested a new X-ray apparatus for determining the degree of decay in living trees, telegraph poles, transmission poles etc. (**5**; May/June 1956).

An automatic grade marker, which automatically stamps the correct grade on any piece of timber which is placed with its end on a chain corresponding to the proper grade, is being manufactured by the Stetson-Ross Machine Co., Seattle (**13**; 1.4.56).

A machine which uses a knife to slice wood without sawdust waste, and which is capable of saving considerable amounts in the manufacture of small items, has been developed by a firm in Lexington, Ohio [cf. *For. Abstr.* 17 (No. 2043)] (**4**; July 1956).

An automatic, air-powered nail puller, weighing 10 lb., pulls out nails undamaged and can dismantle crates, boxes, and temporary building forms without spoiling the wood. Two models, for small and large nails respectively, are available (**4**; May 1956).

A liquid, air-drying casein adhesive developed by a Chicago firm is said to bond immediately upon contact, without clamps or presses, to be suitable for gluing plastic laminates to plywood, or wood veneers to other materials, and to be highly resistant to water and chemicals (**4**; July 1956).

A firm in Georgia collects and bales Pine litter and sells it to nurserymen as an acid mulch. A tree of 8–10 in. diam. produces about 1 bale (58 lb.) of litter a year (**13**; 1.7.56).

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